

P E R S O N A L

COMPUTER

EVERY THURSDAY

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Cover photo by Theo Bergstrom. Tiger: Gerrard Hire, London NW1; plants: Plantation, London SW11; Computer graphic, Jay Myrdal.

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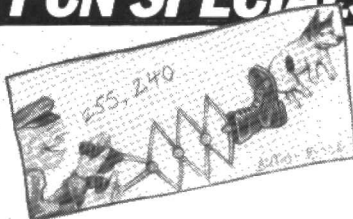
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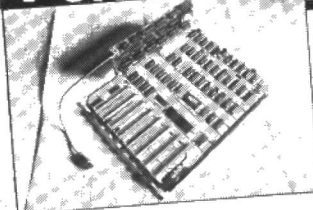
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Readers help design micro

By Ralph Bancroft

PCN readers have helped design what could be the successor to the stricken Jupiter Ace (Issue 35).

A Brighton company, Microkey, demonstrated a pre-production version of its 4500 colour Forth computer to the Forth Interest Group in London last week.

The 4500 is unique in that the final configuration was designed with the help of potential end users — all of them PCN readers. Two thousand of you responded to an advert asking you to complete a questionnaire about what facilities you would like to see on the machine.

Paul Wynter, managing director of Microkey, expects to launch the 4500 in January. It will offer the choice between a 6502 or a 6809 as the main processor (both will run at 2 MHz), 128K of bank-switched RAM and a graphics resolution of 640 by 200 in colour or 1,280 by 200 in monochrome.

A disk system will be available at the same time using Sony micro-floppies.

The hardware for the 4500 was designed by David Huxley of Custom Computers. It is based on a single board computer he designed for Microkey's parent company

which manufactures front-end processors for typesetting machines.

The ROM-based Forth for the 4500 has been written by Sandy Robson of the systems engineering department of Brighton Polytechnic. The department has built up experience of using Forth on different machines for a variety of applications. Mr Robson has based the 4500's Forth on the Forth-79 standard with extensions to encompass the facilities available under Fig-Forth.

The ROM will include interpreter, high-level compiler, editor, double precision arithmetic and utilities including system monitor.

Interfaces on the 4500 are a cassette interface, disk interface, three bi-directional parallel ports and expansion bus. The parallel ports can be used for keyboards (by splitting the 128K RAM into two separate blocks of 64K, the 4500 can allow two users to use the machine in a multi-tasking mode).

Rather than configure the parallel ports for specific applications, eg a Centronics printer interface, Microkey intends that users will adapt them for their own purposes by means of 'pods' that will plug into the ports and provide the required configuration circuitry.

DMS wins on quality

The 'Software Product of the Year' this year, according to RITA (Recognition for Information Technology Achievements), was Compsort's DMS. DMS recently took a tumble in price, falling from £400 to £195.

DMS is a database for newcomers and the RITA award was based on its ease of useage. The RITA awards are unusual in that they are based on nominations from users, rather than on sales volume. With over 5,000 copies sold in the UK alone, DMS clearly has a large

following. Interestingly, it is also available in a wide variety of foreign languages.

Compsort also announced a tie-up between its more advanced database Delta and Lotus 1-2-3. This will allow both products to use each others data files, giving users access to the database facilities of Delta and the statistical and spreadsheet functions of 1-2-3.

Delta can already be linked to Wordstar and a link with Peachtext is under development.

Take-away Comx 35 is taken away

Quality control problems have forced Computers For All to pull the Hong Kong-built Comx 35 off its shelves.

The company withdrew the machine when a batch of 600 systems showed a failure rate above 50 per cent. It has no plans to sell the Comx again at any future date.

The Comx 35, Pro-Tested in PCN, issue 15, looked a very attractive prospect with 32K, colour, a built-in joystick and other features for £120. Computers For

All had high hopes for the machine; a spokesman said: 'The board design was superb and the prototypes we saw were excellent — but in quantity production their quality control wasn't up to it.'

The spokesman said that very few machines if any were actually sold to end users — some went to computer journalists for review and some to systems houses. In tidying up the loose ends, it is promising to repair any stray systems or give a refund on them.

The faults in the batch that it tested were not a result of shipping, the spokesman said. He added that 'its Basic let it down a little,' and that the lack of software was marked. But he concluded: 'It had a lot of potential — we put a lot of work into it.'

A little of what you fancy does you good.

Fancy, tis of ther ...

Фанций Фонт — очинь хорошо.

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FLASHTYPER — If you own a CP/M micro you can now achieve a print quality almost as good as that achieved by a typesetter using little more than an Epson printer. The only other extra you will need is £161 of software called Fancy Font. Available from AIM Research of Cambridge (0223-353985) it uses the graphics mode of the Epson to produce a variety of typefaces in different sizes. The character set supplied includes both serif and sans serif fonts such as Roman, italic, script, Old English and others in a range of point sizes from 8 to 40. It also has patterns for the creation of fonts in the size of your choice for these styles as well as Greek, maths, Cyrillic, musical symbols and zodiacal signs.

Lowe cures tape trouble

Help may be at hand if you're troubled by touchy tapes. Colour Genie manufacturer Lowe Computers has started production of the Black Box, a data stabiliser which the company claims will make any tape recorder compatible with any computer.

This means, for £8.95, you could forget about buying that Commod-

ore or Atari dedicated tape deck.

The Black Box plugs in between the tape recorder and the micro, and works out what it should do with the data that comes in all by itself. There are no knobs to twiddle, and no switches to throw.

Lowe is producing the device with the necessary leads for its own Colour Genie, but most dealers should be able to produce the leads you need for any combination of micro and tape deck.

But how does it work? No comment, says Lowe — it is a black box, after all . . .

Offers galore

By Sandra Grandison

In the countdown to Christmas micro shops and manufacturers have been putting the finishing touches to their special offers.

If a computer is on your shopping list, Comet is selling some at competitive prices. For £134.90 you can pick up a Vic 20 starter pack which includes the micro, cassette unit, introductory software packages and a catalogue.

At £199 you can buy a Commodore 64 with its 16 colours and music synthesiser. And at £139 the Oric 48K is available and comes with a £40 off voucher for the Oric printer reducing it from £169.90 to £129.90.

Tandy has knocked down the price of its Colour Computer for the Christmas rush. The 16K version has come down from £299.95 to £219.95 and the 32K model from £379.95 to £299.95.

WH Smith has also trimmed its prices. For £999 you can buy the Apple IIe home bundle which includes the machine, an Apple disk drive, vouchers and gifts.

Now that the Sinclair ZX81 starter pack offer has come to an end, Smith has decided to put together its own starter pack for the

machine. For £49.95 you can pick a ZX81 machine with a 16K RAM pack.

Atari has put together an educational package for Sesame Street fans. For £29.95 you can buy a piece of software called Alpha Beam with Ernie — a simple number game.

The package comes with a controller, a kind of number pad which plugs into the joystick port at the back of the machine. By buying this Christmas pack you save £5 and it will be available in the shops by the end of November.

In full swing with the festive activities, Galactic Software is running a Christmas competition in which it is giving away 20 Commodore 64s plus 100 joysticks. In addition, Galactic is also releasing a new package called Games Designers for the Vic 20 and 64 at £9.50 and £11.50 respectively. This program allows you to make your own computer games.

But the news on the Electron front is no better (Issue 34). Acorn's new micro is still in short supply, due to the apparent failure of its Far Eastern manufacturer to ramp up production as quickly as had been hoped.

ZX83 leads charge

By Geof Wheelwright

While international computer giants mourn the loss of profits brought on by the summer's price war, Sinclair Research is quietly planning the next campaign.

With sales of the Sinclair Spectrum still moving at a pace a good two weeks faster than Sinclair can handle, the Microdrives and joystick/cartridge software interfaces being ordered through the mail at a hefty rate, and the ZX81 apparently gaining a new lease on life in the form of a starter pack — you'd think the company would consider a truce.

Not so. The troops at Sinclair are gearing up for a battle royal on the cheap business micro scene.

A visit to the Sinclair arsenal earlier this month revealed a good deal as to how this strategic planning will affect us civilians — but it all involves understanding a bit of secret military code.

Nigel Searle, Sinclair's managing director, would not comment on whether the planned Sinclair business micro (code-named the ZX-83, then the ZX 84 and — just to confuse the enemy — it has now reverted to ZX 83) will use the CMOS non-volatile RAM technology that's making the Tandy Model 100 and NEC portables into flavour-of-the-month favourites among computer journalists.

This 'no comment' translates into

an informed guess that Sinclair probably will use the CMOS technology.

Nor will Mr Searle say whether the ZX 83 will be sold in the US under the terms of Sinclair's technology licensing agreement with Timex. What he did say, however, was that the technology agreement would not necessarily entitle Timex to have the machine.

According to Mr Searle Timex's agreement allows it access to 'personal computers' — which are defined as machines selling for under \$500 in the US.

Mr Searle has also said that Sinclair wouldn't have spent as much time as it did developing the Microdrive if it wasn't going to consider other uses of Microdrive technology. He declined, however, to discuss whether the Microdrive technology will be used in the ZX 83.

This is a clear indication that the ZX 83 will use Microdrives.

And if these clues aren't enough to start your Sinclair spy-decoder rings spinning, here's the clincher: the Japanese. Although they may sound like two ordinary words to you, they are a veritable battle cry to Sinclair Research.

Sir Clive has got wind that Japanese manufacturers have been frightened off bringing their often beautifully-designed home computers to this country by his 'I can do it



Sinclair troops prepare for the next microcomputer offensive.

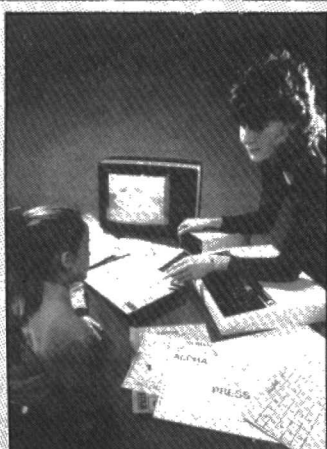
cheaper' approach to the huge under-£200 computer market. And he also knows they now hope to start the long-touted but as yet unseen 'Japanese invasion' in another price bracket.

The Japanese theory (as articulated in recent conversations with their representatives in this country) is this: there is a huge group of people looking for a machine costing more than the average home computer — the price ceiling of which is currently set by the £400 of the BBC micro, but cheaper than the average business machine, which begins at about £1,000.

The Japanese answer to these people is embodied in machines such as NEC's £475 PC-8201A CMOS RAM portable and Sanyo's

£700 MBC-555 IBM-compatible 16-bit machine. They are both different approaches to the problem of staying out of Sir Clive's war-torn Spectrum-price home computer market while steering well clear of IBM's big blue machine.

When it's launched next year — and that date is a much less safe bet — Sinclair's new master weapon looks very much like a portable business computer armed with 16K CMOS RAM (minimum), dual Microdrives, a Liquid Crystal Display screen (a Sinclair flat-screen would be too hard to read), a full-travel keyboard, the ability to run a proper composite video monitor with 80-column screen. It will cost between £400 and £500.



QWERTY NO MORE — Early keyboard instruments had large keys that were hit by the player with a gloved fist. Tinkling ivories were a much later development. With computer keyboards it's happening in reverse, but it hasn't reached the stage yet where you'll need gloves — the Concept keyboard takes A-4 sized overlays so that a single depression becomes a complete word or operation. It is intended to make life easier for young children and most of the machines it works with can be found in schools — Spectrum, BBC, RML, Apple, Pet and Vic 20. Depending on the type of machine, it costs between £18 and £25. It is made by Star Microterminals (0962-51422).

PC Jr jolts its rivals

By Sandra Grandison

After months of intense speculation IBM finally unveiled the PC Junior (code-name Peanut) in the US last week.

The announcement has already given top home computer companies the jitters and in response some have cut their prices. With consumer spending approaching its peak the PC Jr could hurt the industry's Christmas sales if customers decided to wait for it.

The PC Jr comes in two models. The basic model, priced at \$699, is a 64K machine and uses cartridge software. The only unusual feature of the micro is its cordless keyboard that can be used up to 20ft away from the video display. The keyboard uses an infrared system similar to remote control devices for television sets, but a cord can be used. The enhanced version, costing \$1,269, carries a main memory of 128K, has two cartridge slots and provides a disk unit with about 370K.

Both machines run the 8088 processor, with the basic model being upgradable to the enhanced version. Built-in software for the

basic model includes Keyboard Adventure, which uses graphics, colours and sound to highlight the keyboard.

For the upgraded version there's Exploring the IBM PC Jr, a tutorial disk which aims to familiarise you with the keyboard, disk, disk operating system and programming in Basic. And your IBM PC Jr sampler program will help you prepare budgets, write letters, organise files and compile address and phone lists.

IBM also intends to produce a number of PC options. For the basic model there'll be a 64K user memory and display expansion card and a slim-line 360K disk drive.

Other options include a joystick for computer games, a thermal printer and a dozen software packages.

In addition there'll be a communication device that will enable the home computer to receive and transmit information to and from other computers.

An important feature of PC Jr is that it's compatible with IBM PC desk top computers and already several software companies are

rushing to launch new versions of their programs.

The PC Jr could reach British shores by spring 1984. When it arrives the enhanced model could knock Apple off its perch and at the lower end the basic model will be in competition with the Commodore 64.

But Apple could make a comeback with the Macintosh. A spokesman from Apple UK said: 'Our machine, code-named the Macintosh, is still a development project and will not be released until it's absolutely ready. It will be fundamentally different.'

Low-end computer maker Oric also plans to cash in on the PC Jr. Barry Muncaster of Oric said: 'We hope to bring out a piece of hardware in parallel with IBM's PC Jr. Any software that runs on their machine will run on ours.'

One response to the PC Jr, that it will actually cause prices to rise, demonstrates the influence of IBM in the computer world. The machines price — high for its specification — will not deter buyers and could drag others in its wake.

VIEW FROM AMERICA



PC Junior upsets the Applecart

By Chris Rowley

Decidedly mixed reviews greeted the IBM announcement of the PC Junior last week.

As far as the actual machine went nobody seemed very enthusiastic. IBM watchers noted that IBM had completed a major corporate re-alignment, moving away from the mainframe-only company of the seventies and establishing a position from which to become an information processor to the entire world.

In just two years IBM has produced the PC, the XT, the various XT special like the XT370 and now the PC Jr. Analysts point to the end of the 13-year long Government antitrust suit a couple of years ago as the beginning of the new IBM.

At one extreme some analysts predict a speedy demise for Apple and just about everyone else in a totally IBM-dominated computer market five years down the road.

'IBM's new business computers will send Steve Jobs back to Atari sweeping the floors,' 'The game's over for Apple' and other such comments filled the air when the XT370 and the PC3270 appeared. Others, however, tended to disagree and pointed to the hardware for their reasons. From the unpleasant chiclets plastic keyboard to the price tag of \$1500 for a 64K single disk drive system means critics found plenty to scoff at when PC Jr finally took the stage. In fact some were left wondering by the whole exercise. Noting that PC Jr won't be available until next spring or summer they questioned whether IBM was not just trying to freeze this year's Christmas micro market, getting would be micro buyers to put off their purchase for six months.

Clearly while PC Jr is not a business machine it sounds vaguely un-exciting as a home machine too. It doesn't do games very well. This is a 'home' micro for someone with a PC in the office who wants to take work home and who is loyal enough to IBM not to buy a Compac portable — or else it's a home computer to someone rather wealthy who is impressed by the IBM logo and reputation.

Apple can be expected to strike back, and have stripped-down Apple II's selling for \$500 shortly.

And then of course there is the Macintosh, which will run the Motorola 68000 32-bit chip as a 16-bitter thus offering high speeds, for example allowing bit-mapped graphics without slowing down the applications software. This for just \$2000.

In addition there is a strong rumour that John Sculley may have earned his Gold Marketeer Medal by ordering a reluctant Macintosh development department to make the system PC compatible. Apple has rarely made its own machines compatible with each other in the past let alone compatible with anyone else's but this is the shrewdest move possible because if you compare the rather ordinary PC with the Macintosh it is clear that Apple is streets ahead. The Macintosh with a 5Mb hard disk will probably cost \$3500 and will come with bundled integrated software. The PC XT costs more than that without software.

Other computer makes face different problems. Coleco began getting Adams to the shops but there were still problems with the tape drives. However Coleco does have a golden opportunity if it can make enough machines by Christmas.

Likewise, Commodore finds itself wonderfully situated right now. The Commodore 64 is projected to sell 1.5 million units in the next year and is the clear and obvious winner of 1983's Home Computer Stakes. There are however some annoying flies in Commodore's well deserved ointment. The grim shortage of 1541 disk drives continues into its 11th week for many stores. Since Commodore rejected a batch of 30,000 drives from its Long Island supplier due to a high defect ratio, it has been scrambling to find replacement drives. Now another problem is emerging, namely the shortage of 1701 colour monitors. These nuggets of the nitty gritty have kept Commodore's stock from soaring as one might have expected.

■ See PCN, issue 38, for a full Pro-Test of the Coleco Adam.

Osborne ok?

Despite all the traumas at Osborne's US headquarters (Issue 29) the company is still determined to produce the Executive II.

According to Mike Healy of Osborne UK, production of the IBM compatible machine should be restored in two to three months time and will sell at dollar sign \$2,495 including a bundle of software.

For UK users who still feel slightly abandoned, C/WP Computers has joined Osborne UK in giving its full support no matter what the outcome is in the US. It will continue to supply software, and maintenance and extended

warranty agreements will continue to be offered for the life of all machines.

Kaypro is aiming to take over the portable market, tempting users with its 10Mb machine. But Osborne UK doesn't admit any threat — Mike Healy said: 'The Kaypro is badly distributed in this country, and won't make any difference to the sales of Osborne machines.'

Back in the US Osborne is still in the throes of recovering under the Chapter 11 bankruptcy laws. It has clinched a deal with Xerox, whereby Xerox will service existing Osborne computers in the US.

Hard disk gives Tandy more drive

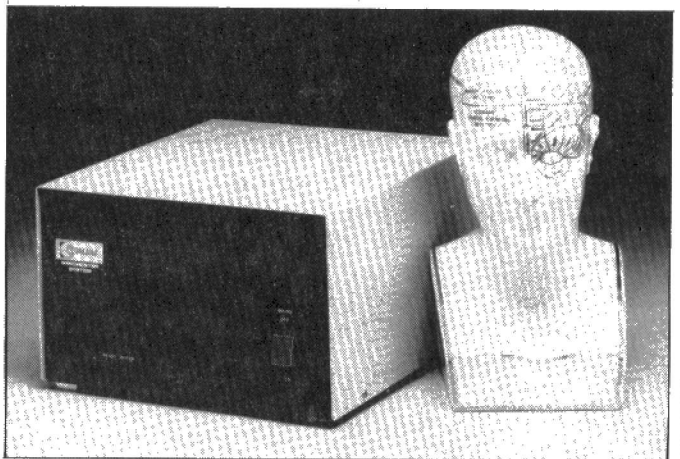
Disk storage options for Tandy users have been increased by Cumana, which has launched Winchester disk drives for the TRS 80 Models III and IV.

Cumana is using the 5¼in hard disks from Rodime — they give you between 5¼Mb and 21Mb per unit, and four drives can be strung

together on a daisy chain connecting cable to provide up to 84Mb.

The drives have a degree of intelligence to control functions like ramp up/down, the stepper motor, and multiple track searches. They are designed to operate with DOSplus 3.5 and 4.0 and LDOS. The 5Mb model will set you back £1,395.

You can buy them as external units or have them fitted into your machine if it doesn't already have disk drives. External drives come in a box that matches the Tandy silver grey.



5¼in cap size for Cumana's bump-free Winchesters.

Basic battle

The military two-step that Digital Research and Microsoft are performing around the Basic language has increased in tempo.

DR (0635 35304) has introduced a utility to convert source code produced by Microsoft's MBasic and its own Personal Basic into CBasic compiler source programs. CBasic (the C stands for commercial) is a DR product which it describes as 'better suited to serious business applications' — better than MBasic, that is.

The utility goes by the cumbersome name of M2CBasic. It is not claimed to translate an MBasic program completely, but DR says

that it should handle 90 per cent of the code. Where it can't make the translation it will print out the locations of unconvertible or suspect code. Two thousand lines of code should take it two minutes to process.

M2CBasic runs under CP/M, CP/M-86, and Concurrent CP/M, as well as IBM's Microsoft-supplied PCDOS. It occupies 64K of memory but scratch files will take this up to 94K in use.

It will cost £97 when it becomes available through DR's dealers later this month — but if you buy it with CBasic the extra cost will be only £30.

Hilderbay hooking in

If you're shopping around for devices enabling your micro to communicate with other systems Hilderbay (01-485 1059) has a new modem and multiplexer for you to look at.

Selling at £71.30 the modem can originate a call or start a two-way conversation and it can respond to a call from another computer. Data transmission is 1200/75 baud.

The modem is designed to be connected directly to the telephone network and different frequencies can be used for transmitting and receiving. However, an RS232 serial card will be necessary extra.

Communications software is available to make an Apple II/IIe into a terminal. And an adaptor which allows the modem to be used as an acoustic coupler will be available at a later date.

For £94.30 you can pick up an RS232 multiplexer which allows a computer to communicate with up to four RS232 devices. You can switch between devices by sending a special sequence of characters.

Hilderbay has also produced some new software for Apple users. At £86.25 each there's Access, a database management package, and Master Maths which will get you to the O-level stage. For £23 you can get Mr &, a set of utilities to help you with Basic programming.

XT gets a rival

The first IBM XT-compatible micro is about to arrive in the UK — and it's portable.

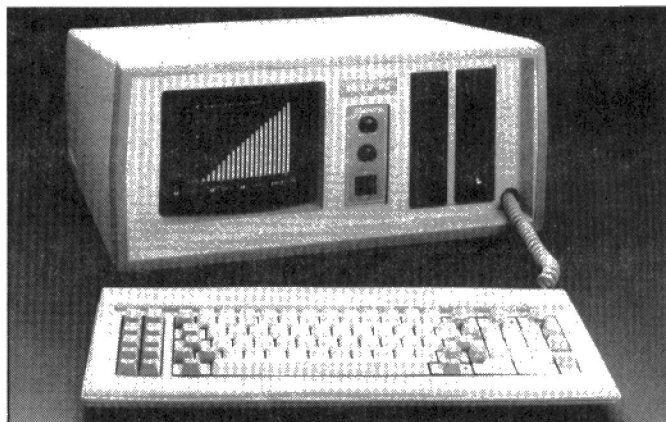
Eagle Computer's Spirit XL matches the high-capacity version of IBM's PC by including a 10Mb hard disk, has memory up to 640K, and offers MSDOS and CP/M-86. It falls heavily on the borderline of portability — 33lbs.

It costs £4,200 — the IBM XT is £4,858 — and is expected to be available in the UK at the end of this month. The Spirit XL's rapid deployment comes about through a deal Eagle of California has struck with Geveke Electronics (04862-26331) which will take over distribution of Eagle's systems in the UK, Holland and France. Eagle wittily refers to it as the Eagle leaving the nest.

Besides the Spirit XL, Geveke will be selling the Eagle PC which checks in at £1,699 in a single-drive version. Like the Spirit it is built around an 8088 but its main memory starts at 64K, expandable to 512K. It has 750 by 352 pixel graphics in monochrome, with a colour adaptor as an optional extra.

You can configure the Eagle PC with single or twin floppies, or with hard disk storage up to 32Mb.

The Spirit XL has a 9in screen and



Looking for a perch in the UK — Eagle's Spirit XL portable.

a keyboard that Eagle claims has the best features of IBM's with several improvements. It also includes colour graphics as a standard feature — the built-in monitor is monochrome but the Spirit is capable of driving this and a colour monitor simultaneously, with the colour image reproduced in eight levels of intensity on the monochrome screen. The machine has two serial ports and one parallel, with four IBM-compatible hardware slots.

There are 'a small number' of Eagle machines in the UK already,

according to Eagle president Ron Mickwee; an audio-visual specialist called Mediatech had been distributing Eagle systems until the deal with Geveke. Geveke says that it will service any existing Eagle dealers who want to carry on, as well as talking to its own network of dealers.

So Eagle users should see continuity of service, and new users will find dealers capable of giving good support, Geveke says. Eagle Computer itself seems to be riding out the US micro scene disturbances without difficulty.

Acornsoft doubles up

Acornsoft has unveiled its 'unique' dual format disk system to allow all its future disk software to be read by both 40 and 80 track drives. It will also be changing any current software to this system as well.

The dual format system comes on

the disks and is located on track one, probably in the !BOOT file, as this can be read by both systems. On receiving shift/break the system attempts to read one of the tracks above track one on the 80 track side, and if an error occurs it will assume a 40 track disk.

The reason for the dual format system, according to Acornsoft, is that BBC micro users are upgrading to 80 track drives.

HP puts £10m into software

Hewlett-Packard announced plans last week to open a £10 million research and development facility near Bristol, which could speed up the configuring of software for the HP-150 micro (PCN, issue 30).

The new business micro, with its touch-sensitive screen as an alternative to the mouse technology, and 3in floppy disk drives, is due for release in this country early next year and it will be closely followed by the opening of HP's first major R&D facility outside the US in the new year.

Although Hewlett-Packard managing director David Baldwin wasn't too specific about the type of research that will be undertaken at the new facility, it was clear that software development for the HP-150 will be high on the company's priority list.

Configuring popular software packages to run under the 'HP-Touch' system (and on the 3in floppies) will require constant work and there's a good chance the new Bristol facility will be doing that work.

Mr Baldwin said the R&D

centre will concentrate on 'computer science' and 'some development of software'.

'We have not spelled out specifically what the program will be just yet,' said Mr Baldwin. He added that hardware development and 'the seed corn of fifth generation computers' will also be high on the list of things for researchers to investigate in the new labs.

HP's move was praised by Trade and Industry Minister Norman Tebbit, who welcomed the new facility and the 50 research jobs it will bring initially to the Bristol area. He also took the occasion to blow the trumpet for the United Kingdom.

'The decision by the Hewlett-Packard company to establish its first major research and development centre outside the United States here in the UK confirms Britain as the free world's second most important base for high technology industry,' said the Minister.

HP's existing headquarters in Berkshire was one of the first to be opened in the UK by a multinational computer company.



HANDY PORTABLE — Olivetti has joined the ranks of Tandy and NEC with its own portable called the M10. About the size of an A4 sheet of paper the M10 has a pop-up, 40 × 8 display screen, query keyboard and 32K ROM which contains the Basic interpreter, text editor, address book and diary. Two versions of the machine will be available — an 8K model at £499 or 24K at £699. You can get your first glimpse of the M10 plus its add-ons at Compec '83, Olympia London.

Maintenance fears grow

The state of micro maintenance gets a firm thumbs down from a survey of 600 users in Western Europe.

Worse, the situation is deteriorating — as the price of hardware falls the costs of labour and training are rising, and the problems of getting prompt and competent maintenance will worsen.

This is one conclusion of 'Maintaining the Personal Computer', the report published by market research firm IPI from its survey of users in the UK, France, and West Germany. The three major problems identified by users were response and repair times, electro-mechanical failures, and the competence of maintenance personnel.

Many respondents complained of an apparent shortage of engineers and the inadequacy of their training. David Lyons, representing IPI in this country, said the level of training for engineers had dropped in recent years and engineers, less qualified than in former days, were now expected to work on a wider range of equipment.

Ninety per cent of respondents expected someone to appear on site

within eight hours of a call. If the micro was returned to a depot, they expected it back the same day.

The report names IBM, DEC and Apple as the three leading PCS sellers and compares their maintenance policies.

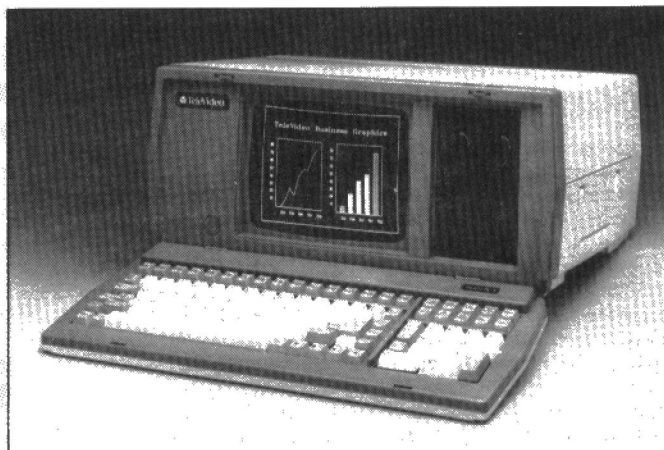
IBM comes off badly, with only a return-to-depot service, unless you want to pay extra for a local IBM dealer's engineer to call and fix your PC.

DEC, on the other hand, does not leave maintenance to a third party, offering a choice of service levels. It also has a fast response option offering repairs within four hours for an extra 25 per cent of the standing maintenance charge.

Apple relies on General Computer Systems for its maintenance arrangements and all warranty work is done via the dealer.

Olivetti has an interesting option which looks towards self-reliance. For £100 a year, it will replace the PC boards for you but you have to decide which ones need to be replaced.

Respondents cited reliability as their primary reason for choosing a particular micro.



PORTABLE NETWORKING — Televideo has moved into go-anywhere multi-user computing with its new TelePorter portable machine. The machine weighs 25lbs and plugs into the company's networking system. It costs £1,351.25 and comes with a Z80 processor, 64K RAM, one 5¼in disk drive, a SuperMouse for graphics applications and two RS232 ports. Free software that comes with the machine includes a word processing package, financial spreadsheet, TeleChart, and the GSX-80 graphics systems extension. Contact Encotel Systems Ltd, 01-686 9687.

Hyperion gets chassis for add-ons

The IBM-compatible portable Hyperion will now play host to a free-standing expansion chassis.

Bytec Gulfstream, the manufacturer of the Hyperion, has announced the Hyperion EX. It will

contain up to seven IBM cards for memory expansion, networks and special communications.

The storage heater-like unit can also contain a five or ten Mb Winchester disk system. Four Hyperions can share it in a local area network or via modems and telephone lines. The empty unit is expected to cost around £1200. Bytec has also announced the popular Lotus 1-2-3, a combined spreadsheet and graphics system, for the Hyperion.

SOFTWARE NEWS

Business

DR: Can the leopard successfully change its spots? Digital Research, producer of CP/M and many other items of systems software, has launched its first applications package. DR Graph is a menu-driven package that runs with GSX, the graphics extension to CP/M, and aims to help business users transform dull figures into living graphic output. DR is on 0635 35304.

TELEVIDEO: Encotel (01-680 9687) has a similar product, Teledraw, available for the Televideo personal computers including the Teleporter. It costs £164. Digital Research, backing a number of horses, has agreed with Televideo to enhance the package.

IBM, SIRIUS: The Bristol Software Factory's Silicon Office has already been enhanced by the addition of a financial management system. This joins ledgers and controls, word processing and office filing in the package which costs £1,390 and runs on the IBM and Sirius machines. Information from 0272 735022. Microsoft (07535 59951) has released another version of Multiplan, its spreadsheet program, to take advantage of 128K systems. Existing users will pay

£20 for the update, new customers £199.

COLOUR GENIE, DRAGON, NEWBRAIN: For the 32K Colour Genie DC Kent (0773 872244) has released Knominal as the base for its financial package system, for £25. The Dragon Dungeon (0335 42529) has published Cash Flow and Catalogue, Sort and Mail for the Dragon. Backing the Newbrain revival Elstree Computer Centre (01-953 6921) has added packages for hoteliers, chemists, and doctors to its range of business software.

Education

BBC: Book publisher Shiva (0270 629440) has moved into the software field and plans over the next six months to produce tapes and books that will form a child's introduction to mathematics. The first four tapes, for the BBC B, concentrate on numeracy and logical thought; they cost £14.95 each.

ELECTRON: For children from three to 11 years old Acornsoft has produced eight packages supported by brochures and notes for the guidance of parents and teachers. Each one costs £9.95; they run on the BBC micro but Electron versions should be available next month.

PCN rounds up the software releases.

SPECTRUM: Computer Tutor's motto — 'Makes fun out of learning' — sounds promising; its products come under the collective name Clever Clogs and the first three units are due in the shops soon. Again it is aiming at younger children, as long as they have a 48K Spectrum. The tapes cost £6.50 each. Computer Tutor is on 0480 213969.

Games

SPECTRUM: Software producers seem to be rallying round Currah's Microspeech synthesis unit — Bugbyte, Digital Fantasia, Artic and Ultimate have verbal versions of games out for the Spectrum.

BBC, 64, DRAGON: But the standard visual approach continues to attract new companies. Alligata has opened in Sheffield (0742 686040) with games for the BBC, Commodore 64, and Dragon. It also has Alligatacalc, a spreadsheet for the BBC, a database for the Dragon, and others. Prices start at £5.95. Choplifter, Seafox. The games cost £29.95 each.

SPECTRUM, BBC: Elephant Software (06286 2292) has released Kosmik Pirate for the 48K Spectrum for £5.65. Computer-solve (01-390 5135) has Mrs

Mopp for the same machine, and Birdie Barrage, a golfing game, for the BBC — the prices are £5.50 and £7.95.

64, VIC: For the Commodore 64 J Morrison Micros (0532 480987) has produced Vultures, a 'galaxian' type game, costing £6.95. For the 64 and the Vic 20 Mogul, a recent arrival from the US, offers Annihilator at £5.99. Mondatta (01-377 0806) is aiming at users of the 64 with Taxman and Supercopier, each £5.65, and buyers will automatically enter a draw for a disk drive and printer. Audiogenic (0734 595647) has three new cartridges and one disk-based game for the 64: Serpentine.

TI: Stainless Software of Stockport may have chosen the wrong time to launch games and other programs for the Texas Instruments 99/4A. Its catalogue now includes 96 titles, and the prices run from £5 to £19.75.

Systems Software

CP/M: The third edition of the CP/M Software Finder will be published by Digital Research later this month, containing information on 2,000 packages.

UNIX: Into a higher division, Aston Technology is putting Redwood's Unix software products on its Crystal 68000 range.

US fires first Salvo

By Shirley Fawcett

At last a show without end users and hardly any hardware in sight. That was the feeling among the industry stalwarts gathered in San Francisco for the National Software Show, a production held in a posh hall down at the more dubious end of town and featuring nothing but yards and yards of micro software.

Too much of it, many dealers were complaining. One reason for the trade-only format of the show was the feeling among dealers that they just couldn't hope to keep up with the conveyor belt of new product releases. As a result most new products would never reach the local computer stores, they said.

It was chiefly the smaller software houses that were there, showing their wares in the San Francisco sunshine. There was no sign of Microsoft or Digital Research or most of the big names, but there were some pretty classy products being launched all the same, supporting the old belief that the real innovations come from the smaller companies.

One star of the show was F-1, a do-everything micro operating system that pulls apart and plugs together to handle anything from a single-user, single-task job to full-blown networking systems. It came

from Multi-Solutions of New Jersey, and it was getting a lot of attention from hardware manufacturers and systems houses.

F-1 could be configured as a real-time control system, said Robert Knight, the man who wrote it, and who wrote the language in which it's written. Or it could be made to behave like Unix or a Concurrent CP/M system. It could handle virtually any type of file and read or write to CP/M, MSDOS, Unix, and all sorts of other files. It might also take between 4K and 80K of memory, depending on how ambitious a system you need.

Another sample of mainframe software thinking came in the shape of Salvo, from Dallas-based Software Automation, billed as a fourth generation language for micros. The Salvo package runs on the IBM PC and contains a relational database with an English-style query language that will double as an applications generator. The language also has limited artificial intelligence capabilities and can guess at the file required when the user gets the name wrong.

Salvo is due to appear in the UK in January when Software Automation's UK office should be opening. It is priced in the US at \$495, or \$595 for the 'programmers' version

which brings such features as colour and brightness enhancements.

Operating system compatibility was a hot topic at the show. From Touchstone Software came Mimix II, a CP/M emulation package for the Fortune 32:16 micro. Company president Larry Dingus said that this version of Mimix resides on the Fortune's Z80-based communications board, and it lets users of what are nominally Unix-controlled systems run CP/M software, use CP/M data, and extract data from Unix files.

The company is also due to announce an MSDOS emulator for Unix systems at Comdex this month and a front-end to Unix in the first quarter of next year.

Advanced DB Master, a new \$595 high capacity IBM version of Stoneware's Apple-based information management system, made its debut at the show. Add-ons to existing products were also there in force. From Software Arts (known best for TK Solver, launched earlier this year) came news of more applications packages for use with TK Solver — a building design and construction package will be ready in January, said marketing manager Carol Vallone, and electrical engineering and statistical packages are in the pipeline for early next

year.

Sensible Designs of San Diego launched dProgrammer, an applications generator for use with dBase II. There were also several graphics packages for the IBM PC launched at the show.

From a new US software publishing company, IMSI, came 4-Point Graphics, a \$195 package for graphics designers or business people who want to create presentation slides. And Time Arts took the wraps off Easel, a similar product that relies on a digitised pen and a tablet for input. 4-Point Graphics will work with a keyboard, a mouse, a touch-sensitive screen or a bit-pad.

Finally, something completely different came from Human Edge Software in the shape of a blend of psychological theory and expert systems techniques; it is intended to make super executives out of ordinary business folk. The company's packages, Management Edge and Sales Edge, get the user to rate him or herself, the business opportunities, or employees, and the situation itself on psychological scales such as aggression. These packages (for IBM and Apple systems) are claimed to produce the perfect strategy for business and sales success. A snip at \$250 apiece.

Thoroughbred enters race

With the IBM PC XT approaching its first anniversary in March 1984, a US company has decided to widen the machine's scope and has produced a piece of software called the Thoroughbred/OS.

Thoroughbred/OS has multi-user capabilities which means the PC XT will be able to run more than one application simultaneously. Current users need not buy any

additional custom boards to upgrade their machines to multi-user compatibility because all the necessary hardware is already there.

SMC Software Systems says that its operating system outperforms other multi-user operating systems such as Unix which is now being implemented on several popular business machines.

The new multi-user operating system supports the full line of Thoroughbred Software and comes with Business Basic, which contains all the arithmetic functions needed for writing business applications.

dBase debate

The first meeting of a planned dBase II user group will be held on November 16 at the Royal Garden Hotel, Kensington, London W8 at 10.30am.

The pre-lunch session will in-

clude election of a chairman, appointment of a committee to include dealers and software designers, news from Ashton Tate, and a question and answer session.

Further enquiries should be directed to David Imberg, at Ashton Tate, on 0908 568866.

New modes of being emerge for Dragon and Spectrum

Modes for the Spectrum and Dragon are due to come into fashion from Softek.

They include an as-yet unchristened program which provides the Spectrum with another mode. Once you have loaded the Softek cassette it gives you 64 characters to the line instead of 32.

Mode 5 is for the Dragon. The

micro itself comes with four modes, and this fifth will let you mix text and graphics on the same screen.

It also gives you lower case letters — another thing the Dragon doesn't do, and you can change the character set to include foreign alphabets. All for £6.95 from Boots, Laskys, or direct from the company on 01-240 1422.

Zita survives

The Andromeda Zita has bounced back from the financial crisis that overtook British micro maker ITCS this summer.

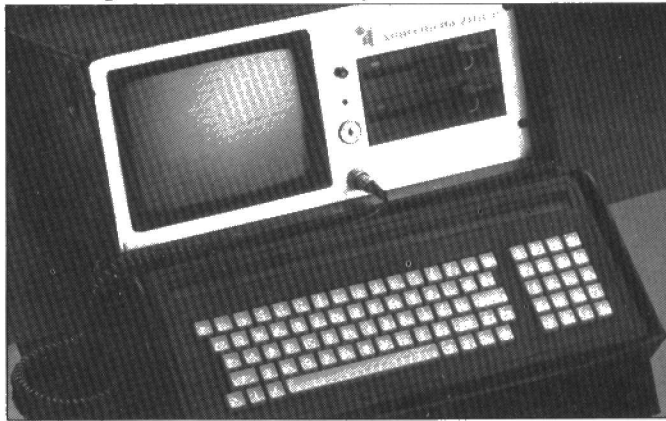
The Zita portables are on sale again, from the newly formed Zita Microsystems (0784 63212) which has risen from the ashes of ITCS. To confirm its recovery Zita plans to launch an IBM-compatible portable at Compec later this month.

ITCS was to a large extent dragged down by its manufacturing arm; a spokesman for Zita said: 'It couldn't actually produce the unit, it failed to meet demand,' Zita aims to avoid a repetition by subcontracting manufacture of the

machines to specialist micro builders, and it has also found international backing to fund the recovery.

ITCS founder David Lewis-Pryce is still involved in the company, 'in the background', the spokesman said, and Bill Bignell is now managing director.

Luggage micros remain popular, and the Zita systems still look competitive. A system with 128K, twin 500K floppies, and bundled software nominally worth £2,000 will set you back £1,595 plus VAT. The existing systems software feature Z80 CP/M and 16-bit CP/M-86 options, and the Zita-E executive systems also have a real-time clock.



The Zita portable — a UK survivor thanks to international backing.

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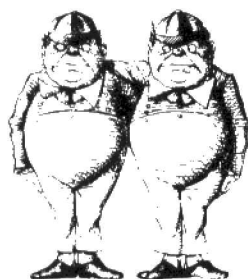
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PCN Charts

This top 30 games list is compiled from both independent and multiple sources across the nation. It reflects what's happening in high streets in the two weeks up to October 27 and, like the micro charts, does not take account of mail order sales. The micro charts this week show the number of machines sold in the same two-week period so they tell the story in the high street between October 14 and October 27.

GAMES

Top Thirty

		GAME TITLE	PUBLISHER	MACHINE	PRICE
▲	1 (2)	Kong	Ocean	Spectrum	£5.95
▲	2 (6)	Manic Miner	Bug Byte	Spectrum	£5.95
▼	3 (1)	Jet Pac	Ultimate	Spectrum	£5.50
▶	4 (4)	Zoom	Imagine	Spectrum	£5.50
▲	5 (8)	Hobbit	Melbourne	Spectrum	£14.95
▼	6 (5)	Penetrator	Melbourne	Spectrum	£6.95
▲	7 (10)	Harrier Attack	Martech/Durell	Oric	£7.95
▼	8 (3)	Flight	Psion	Spectrum	£5.95
▲	9 (30)	Gridrunner	Llamasoft	CMB64	£7.95
▲	10 (13)	Arcadia	Imagine	Vic 20	£5.50
▲	11 (21)	Devil of the Deep	Shepherd	Spectrum	£5.95
▼	12 (11)	Jumbo Jet Pilot	Thorn/EMI	Atari	£29.95
▼	13 (9)	Horace and the Spiders	Psion/Melbourne	Spectrum	£5.95
▲	14 (27)	Hovver/Bovver	Llamasoft	CBM 64	£7.50
▲	15 (17)	Zip Zap	Imagine	Spectrum	£5.50
▲	16 (—)	Golf	C/Rentals	Spectrum	£5.95
▲	17 (—)	Scrabble	Psion/LG.	Spectrum	£5.95
▲	18 (19)	Football Manager	Addictive	Spectrum	£5.95
▼	19 (16)	Yomp	Virgin	Spectrum	£5.95
▲	20 (23)	Tranz AM	Ultimate	Spectrum	£5.50
▲	21 (—)	3D Deep Space	Postern	Acorn	£8.00
▲	22 (24)	Monsters in hell	Softek	Spectrum	£6.00
▼	23 (22)	Xenon 1	IJK	Oric	£8.50
▲	24 (—)	Xadom	Quicksilver	Spectrum	£6.95
▼	25 (18)	Hall of Things	Crystal	Spectrum	£7.50
▲	26 (—)	Blue Max	Synapse	Atari	£27.95
▲	27 (—)	Cookie	Ultimate	Spectrum	£5.50
▼	28 (20)	Heathrow ATC	Hewson	Spectrum	£5.50
▼	29 (13)	Pool	CDS	Spectrum	£5.95
▲	30 (—)	Hunchback	Superior	Acorn	£7.95

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PCN Charts

Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, is updated every alternate week.

PCN Charts are compiled exclusively for us by MRIB (Computers), London, (01) 408 0250.

HARDWARE

Top Twenty up to £1,000

MODEL		PRICE	DISTRIBUTOR
▶ 1 (1)	Spectrum	£99	(SI)
▲ 2 (3)	CBM 64	£229	(CO)
▲ 3 (4)	BBC B	£399	(AC)
▼ 4 (2)	Vic 20	£140	(CO)
▲ 5 (6)	Texas/99/4A	£99	(TI)
▼ 6 (5)	Oric 1	£99	(OR)
▶ 7 (7)	Dragon 32	£170	(DD)
▲ 8 (9)	ZX 81	£45	(SI)
▲ 9 (12)	Atari 400	£150	(AT)
▼ 10 (8)	Atari 800	£300	(AT)
▶ 11 (11)	Colour Genie	£168	(LO)
▼ 12 (10)	Sharp MZ80A	£349	(SH)
▲ 13 (14)	Aquarius	£70	(MA)
▲ 14 (15)	Lynx 48/96	£225	(CA)
▲ 15 (16)	CGLM 5	£150	(SO)
▲ 16 (17)	Sharp MZ700	£240	(SH)
▲ 17 (20)	Apple IIe	£969	(AP)
▶ 18 (18)	Epson HX20	£472	(EP)
▶ 19 (19)	Nascom 3	£349	(NA)
▼ 20 (13)	Tandy Colour	£240	(TA)

Top Ten over £1,000

▲ 1 (2)	Act Sirius	£2,525	(ACT)
▼ 2 (1)	IBM PC	£2,390	(IBM)
▲ 3 (10)	Apple III	£2,780	(AP)
▼ 4 (3)	DEC Rainbow	£2,714	(DEC)
▼ 5 (4)	Commodore 8000 series	£1,200	(CO)
▲ 6 (7)	Epson QX10	£1,995	(EP)
▼ 7 (5)	HP86A	£1,438	(HP)
▶ 8 (8)	British Micro	£1,495	(BM)
▼ 9 (6)	Olivetti M20	£2,400	(OL)
▼ 10 (9)	Ajile	£2,995	(AJ)

AC Acorn Computers. ACT — ACT. AJ — Anderson Jacobson. AP — Apple Computer. AT — Atari International. BM — British Micro. CA — Computers. CO — Commodore. DEC — Digital. DR — Dragon Data. EP — Epson. HP — Hewlett Packard. IBM — IBM. LO — Lowe Electronics. LL — Lucas Logic. MA — Mattel. OL — Olivetti. OR — Oric. SH — Sharp. SI — Sinclair. SO — Sord. TA — Tandy. TI — Texas Instruments.



PROGRAMMERS

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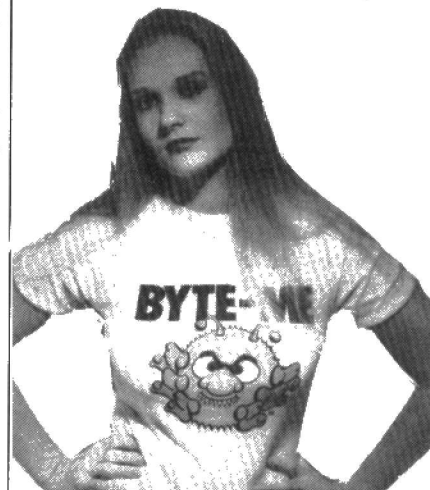
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Oric's Zodiac solution

I have just solved the G M Philips version of ZODIAC. If any reader is stuck at any point and would like help ask him to send a stamped addressed envelope to 199 Aldfrid Place, Newton Aycliffe, Co Durham DL5 4QG, and I would be glad to help.

It is the 48K Oric version.
*Stephen Vallis,
Co Durham.*

A consumer's criticism

On a recent shopping trip my mum and I went into shops to get 'hands on experience' with home computers. Having been into computers for three to four years, I had some idea of what I was looking for, and I'd been giving my mum some advice! However, we soon realised there were more problems in computer sections of shops than were mentioned in previous *Random Accesses*.

In one shop there were nine popular computers in a small room. The Sharp was turned off, the Ataris and TI had cartridge demo software *RUN*-ing on them, which soon became boring, and all the other computers had kids writing two-line programs.

The computers were arranged so the VDUs were face level, and the keyboards waist level, very awkward, and involving a lot of head movement. We were about to ask the



Don't carry a **LOAD** on your shoulders,
unburden yourself on *PCN's* letters page.

showed us the Commodore 64, explained the machine's facilities, and was not stumped by Simon's Basic.

In the light of this, here's some advice to shops: Spread out computers. Place computers in comfortable positions.

Devise some way to prevent the idling two-line program players.

Train your assistants well, and find someone who is keen.

*David R Heath-Whyte,
Chalgrave, Oxford.*

Prototype Elan had us fooled

In your mention of the Elan computers when reporting the PCW Show (Issue 31), you state the demonstration was produced by a video tape recorder.

This is not true. The capabilities of the Elan Enterprise have never been demonstrated by use of a video tape recorder. At the PCW Show and elsewhere the demonstrations were being produced by prototype computers containing circuitry directly equivalent to that of the Elan Enterprise 64.

Because of the complex circuitry of the computer, which is implemented using custom chips in the production model, the prototypes contained standard chips which could not fit in the standard box. These were separately mounted and connected to the computer keyboard units by cable. No secret was made of this.

Of course, all demonstrations (which were programs contained in EPROM) were controlled from the computer keyboards.

This makes me wonder if your faith in us is such that you expect us not only to create home computers with outstanding features, but also to design video tape recorders the like of which has never been known.

*Robert Madge,
Elan Computers, London.*

Our apologies, but on the final point, we live in hope — Ed.

Basic takes a beating

I have some sympathy with Messrs Kramer and Daldey (Issue 30). However, I feel they are both missing the point.

Someone, somewhere, has decreed that most micros should use Basic, indeed, they have it in ROM so you are stuck with it. This language was designed as a simple language for beginners. It is quite true it is difficult to use without a lot of POKes, but this is a reflection on the limitations of the language. I carefully picked a machine on which I can use various languages.

As for the manuals, the Vic-20 one is pretty useless. Sure it tells you what to do, but it gives no clue why you should do it. I suspect manual writers are out of date on what's going on in schools. My youngest son was introduced to micros three years ago when he was seven. His reaction when shown a Vic-20 manual was to chuck it in the bin. The best manuals I have seen are those for the Sharp M280B and the Dragon (though the latter contained a long errata list).

*R H Hill,
Woodford Green, Essex.*

Timely warning saves the day

May I express our gratitude to your excellent magazine for your article giving information of the hardware changes in the Sinclair Spectrum (Issue 32).

Our company, which has been established three years and caters for the specialist market of amateur radio and short-wave listeners, has just launched a system using the Spectrum for decoding and displaying morse code and radio-teletype signals. The system depends upon the use of the EAR socket on the Spectrum. Our nationwide advertising campaign had just been published in the specialist press, and we had commenced receiving orders and enquiries when we read your article. Imagine our horror when having tracked down an Issue 3 machine we discovered our system was not compatible with it.

We found no consolation in the letter from Sinclair that we, among others, were guilty of making certain assumptions about the Spectrum which were completely unsupported and undocumented by them. We always mask irrelevant bits in our programs, but this one is relevant. For such a statement to be 'supported' I would expect the manual to contain more information than:

'D6 is the value at the EAR socket' . . . and 'sometimes, though, the Spectrum hardware might get in the way.'

We believe the Spectrum would be very poorly supported by software, if the only programs were those created solely from their documentation.

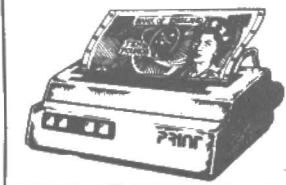
Thank you, *PCN*, for without your timely article we would have had many dissatisfied customers, and almost certainly a financial disaster. We managed a holding operation until we solved the problem.

*G E Mason,
RADSOFT, Sunderland.*

Share your thoughts in the UK's liveliest micro weekly letters columns. Funny, feisty or fanciful, your letter could win you £10 if it's of star status.

WRITE TO: Random Access, Personal Computer News, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

PCN £10 Star Letter



assistant about the computers when we heard him answer a man inquiring about educational software for a micro: 'I expect so, I'm not sure, have a look on that shelf over there'.

In the next shop, an electrical equipment shop, the display of five micros was not significantly more roomy, but the displays were nearer to the keyboard, and the shop only allowed children accompanied by parents to play with the machines — a slightly controversial approach, but it worked. The assistant established our needs,

Lost in a maze of bits and bytes, trapped in a forest of errors, bugged by Basic? Whatever the problem, CALL on us. Our panel of experts is at your command.

Write to: Routine Inquiries,
Personal Computer News,
VNU, Evelyn House, 62
Oxford Street, London W1A
2HG.

Oric-1 ROM revisited

QIf you run the following program, it displays a part of the Oric's ROM, including the ERROR messages and the commands.

```
10 FOR X = 49386 to 60122
20 C = PEEK(X)
30 PRINT CHR$(C);
40 IF C < 100 THEN NEXT
50 PRINT:PRINT
60 NEXT
```

I have 3 questions: the program shows three commands that are not in on the Oric ie INVERSE, NORMAL and AUTO — how come? Can these be accessed by an m/c routine or by pokes or by CALLing the code?

How does the Oric work? Does it read the ROM into RAM for the keywords and if so where? I've seen a program to change the keywords and error messages on the Vic-20 so is it possible on the Oric-1?

Is there any way to change the border colour on the Oric?

Nick Paul,
Dyfed, Wales.

AUTO is part of the ORIC's command set: it's not used to automatically number your program lines as with machines like the BBC, but to make a program RUN automatically once its LOADED. It's used like this:

CSAVE"NAME",AUTO.

The other two commands will give SYNTAX ERROR if you try to use them. Some say this is because Oric began the ROM using the Basic from Tangerine, and as they then used serial attributes to set colour these commands became redundant but were never removed from the ROM.

To change the error messages is not easy, but here are a few pointers. The first thing you would have to do is devise a machine code routine for error trapping. This would get an error code from somewhere, possibly the accumulator, or it may be pointed to by the X and Y registers, but we don't have the exact information.

Your routine would then enter a loop wherein it took the

ASCII characters for the message you wanted, put them in turn into the accumulator, and then called the routine at F57B (which prints a character from the accumulator).

You will have to terminate your ASCII string somehow say with a null, and trap this in the loop.

To make your Oric jump into your routine when an error was encountered, you would have to DOKE 001B with the start address of your routine. 001B is where the Oric branches to when a Basic program stops — due to an error or a control-C, so it's useful for program protection as well.

The Oric ROM lies between addresses C000 and FFFF, it is not read into RAM; what you are probably thinking of here is that the character sets (ASCII and teletext) are read into RAM on boot-up. Exactly where these are depends both on the size of your RAM and whether or not you've used GRAB or RELEASE.

The border area you refer to is not able to be changed in any way as far as we know.

Building a bigger vic-20

QI am in need of some advice about expanding my Vic 20. I have a cassette unit and super expander cartridge. As finances are limited I am seeking the cheapest way to expand the memory and capabilities of the machine.

Also, is there any chance of printing a photograph of what the inside of the Vic 20 looks like. I am intensely curious about it but cannot touch mine until the guarantee runs out. I have in mind the possibility of some vacant chip sockets which might be filled to upgrade the machine to something like the 64.

Can you tell me how to go about setting up data files using my Vic? The two manuals I've got appear to be very sketchy on the subject?

R S Thorndycroft,
Portsmouth, Hants.

AUnfortunately, by plumping for the super expander cartridge first you are somewhat limited now for cheap memory expansion. Although as a stand-alone unit the super expander is excellent value

offering both extra memory, and extra high resolution graphics and sound commands, it does mean that when you buy more memory you are committed to buying a motherboard too.

This is because the super expander does not duplicate the cartridge port. There are now a number of very cheap RAMpacks on the market, including one for 64K. Things to look for are switchable packs which allow you to reconfigure the set-up to different memory sizes at the flick of a switch.

If you want to use the super expander as well you need the motherboard which should also be switchable for convenience. You're probably looking at something like a £60 bill for these two items.

On the question of expanding the abilities of the Vic, once you have the memory you can do virtually anything you wish.

In the US the word is that the Vic is still outselling the 64 because there is so much software and so many peripherals available that virtually any application is possible.

As for opening up your Vic, save yourself the trouble. There are no empty ROM sockets inside... the cartridge port is the only way to expand — hence the need for a motherboard. Upgrading the Vic to a 64 is out of the question and is a fine lesson in not judging by appearances as there are several major differences.

Not least of these is the far superior dedicated graphics chip in the 64 which gives the sprite graphics facility, and the equally superior sound chip.

Finally, it is not that the manuals are sketchy on the subject of data files so much as that there's not a great deal to say on the subject.

To open a file to cassette use the following: OPEN 1,1,1. The first number is the file number, the second the device number and the third tells the Vic that you will be writing to tape.

You can give each file a name in the same way as you do with programs: OPEN 1,1,1, "YOUR DATA".

To get your information on tape use the PRINT# statement followed by the file number (1) then your data. The data can be in literal form ie PRINT#1, "This is the data", or in variable

form ie PRINT#1,A\$B\$,C,D.

To output a list of data simply use a FOR...NEXT loop but each item should be followed by a carriage return (PRINT#1,CHR\$(13)). When you have finished writing data, make sure you close the file with a CLOSE1 statement.

To get the information off the tape simply open the file again but this time use command number 0 to tell the Vic you will be reading data (OPEN 1,1,0, YOUR DATA). You can then read the data either in individual characters with the GET# command, or in strings with the INPUT# command. Simple, isn't it?

A Brother for your Spectrum

QI have a 48K Spectrum and am considering buying the Brother EP-22 to use both as a typewriter and as a computer printer. The printer has a built-in RS232C type serial interface. What do I need to connect my Spectrum to this printer and where do I get it?

S Fifer,
Enfield, Middx.

AFirst of all, it's theoretically possible to interface almost anything to almost anything else.

But the problem is turning the micro's output into something that the output device — printer, typewriter, hair dryer — can understand. The Spectrum on its own has neither a Centronics or RS232 interface, and therefore as far as printers are concerned can communicate with precious else but the ZX Printer.

But all is not lost — Sinclair's own Interface 1 has an RS232, and there are a number of Centronics interfaces on the market for the Spectrum.

Now you have your 'sending' end sorted out, you next have to think about your receiving end. In the case of the Brother, this is easy, as its RS232 will allow kit to receive data from a Spectrum with Interface 1.

So when you buy your Brother, buy it from a dealer who's willing to make up the correct cable for you. In fact, in a lot of cases, it's best to buy from the dealer who's willing to make up the cables you need, and sell them along with whatever you're buying.



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Putting copyright on your Oric-1

The suggestion by A Hutton in PCN Issue 35 for obtaining the copyright symbol in a REM statement was an excellent one.

There is, however, no need for the relatively 'hit and miss' process of attempting to PLOT CHR\$(96) at the appropriate position on the screen.

All that is required is to type the desired line without the copyright symbol and, after executing RETURN as a direct command, PRINT CHR\$(96).

The desired line should then be copied into memory using CONTROL A up to the point where the copyright symbol is to be inserted. The cursor can then be repositioned over the copyright symbol, which has been printed on the screen, by use of the cursor keys and then copied with CONTROL A.

Finally, the cursor keys should be used to move the cursor back to the next character in the REM line and copying continued to the end of the line.

D J Farmer,
Rugby,
Warwickshire.

HIRES routines in the Oric-1 ROM

In PCN, issue 34, Routine Inquiries, Matthew Villard wanted to know the addresses of certain Oric ROM routines. The HIRES routines can be found as follows.

Routine	Address
CURSET	#EBDF
CURMOV	#EBE2
DRAW	#EBE5
CIRCLE	#EBE8
PATTERN	#EBEB
CHAR	#EBEE
POINT	#EB1F
FILL	#EBFA

Parameters are passed through

the PARAMS area. This area is a set of 2-byte registers starting at #2E1 eg CURSET X,Y,FB is translated as follows.

X is deposited in #2E1, #2E2
Y is deposited in #2E3, #2E4
FB deposited in #2E5, #2E6

As all these have maximum values of less than 255, the high byte in each case is zero. The value passed back in POINT can be found in #2E1, #2E2 on return.

(The source of all these details is the FORTH cassette with the optional HIRES routine)

Andrew McDermott,
Faringdon,
Oxon.

Taking the stripes off the Lynx

Some Lynx owners may have experienced problems with obtaining a stable TV picture. On my black and white portable, the problem is wavy verticals and frame tearing at the top of the screen.

The picture can be much improved by changing the values in two registers of the 6845 CRTIC chip. The two are: R3, Synch Width and R4, Vertical total.

To alter R3 run:

```
10 OUT &86,3
20 OUT &87,N
```

with differing values of N

To alter R4 run:
10 OUT &86,4
20 OUT &87,P

with differing values of P.

On my TV set the best values

are N=6 and P=74.
Bob Towers,
Hamilton,
Scotland.

A DIM view of byte arrays

When writing data storage programs for the BBC and Electron computers, it is often more economical on memory to use byte arrays than Basic arrays for string storage. It would be handy to dimension a number of byte arrays and put the start addresses into a Basic integer array. However, this cannot be done directly. That is, the program below will not work, because of the bad DIM at 30.

```
10 DIM address%(50)
20 FOR stores=0 TO 50
30 DIM address%(stores) 100
40 NEXT
```

However, it will with the addi-

tion of
25 DIM temp 100
30 address%(stores)=temp
Apparently, and fortunately in this instance, there is no error generated when a byte array is re-dimensioned.

J W Penfold,
Benfleet,
Essex.

Make your BBC program safer

Methods which protect programs from being listed on the BBC microcomputer and which rely on inserting a character to turn off the VDU, can always be defeated by listing the program from a line after the one with the special character in it. An alternative protection mechanism, without this fault, is outlined below.

1 Find the value of TOP for the program to be protected.

2 Insert the statement: LOMEM=(value of top)+20 at the start of the program.

3 Find the new value of TOP, on hex.

4 Type in: ?(TOP-1)=0

5 Type in: "SAVE "NAME"
EOO new value of TOP in Hex BD2C.

(EOO is the value of page on a cassette system and BD2C is the action address of RUN in Basic 1)

6 In Basic 1, at least, the program can be loaded and RUN by typing: "RUN "NAME". Otherwise the program can be loaded and run as normal but cannot be listed.

D J Pilling,
Blackpool,
Lancs.

Vic-20 machine code routines

Here are some routines that a Vic-20 machine code enthusiast may find useful.

What follows is a brief description.

1 &D1AA This converts a floating point number in the floating point accumulator into an integer held in standard low/high byte format in the Y register and the A register.

2 &D391 This converts an integer held in the Y and A registers into a floating point number and puts it into the floating point accumulator. It is exactly the opposite to the first routine.

These two routines are useful because the argument to the

USR(X) function is placed in the floating point accumulator. These routines therefore allow you to easily pass a parameter to a piece of your own code, and also pass one out to Basic, since the result given to Basic is whatever number is left in the floating point accumulator on returning from your machine code routine.

3 &DDDD This routine takes the floating point number held in the floating point accumulator and converts it into an ASCII string, starting at &0100. The end of the string is marked by a zero byte. The number is not printed, however, so unless someone knows of a routine to do this, the following machine code routine can be used.

```
LDX #&00      ;Initialise X reg
                ;digit
LDA &0100,X    ;Load
                ;accumulator
                ;from location
                ;plus X
INX            ;Next char
JSR &FFD2      ;Print the ASCII
                ;char in A
BNE digit      ;If char is not
                ;zero then next
                ;char
```

Andrew Dilley,
Godalming,
Surrey.

OLD features on new machines

One of the features sadly lacking on the Dragon 32 is the ability to OLD a program, once it has been NEWED. When using machine code, it is very easy to cause a program crash and lose many hours work. The program below, is a short machine code routine which will reinstate any program that has been NEWED, or crashed in any other way, providing that the power supply has not been interrupted.

The routine will bring back a lost program on entry of EXEC 32750. However, the program will not work if a new Basic line has been entered or a new variable assigned.

```
10 CLEAR 200,32749
20 DATA
    158,25,189,131,48,2,159,
    27,159,29,159,31,57
30 FOR T=1 TO 14
40 READ
    A:POKE 32749+T,A
50 NEXT T
Andrew Williams,  
Southport,  
Merseyside.
```

A lookalike, soundalike Torch, but Susan Curran finds plenty to distinguish it from the old flame.

How bright the Tiger?

Contrary to the received wisdom of a year or two ago, the 8-bit business micro is not dead yet. The Epson QX-10 has hit the best-seller lists, and on a more modest scale Cambridge is making a name for itself as the home of 8-bit multiprocessor colour communicating micros.

A pretty limited class, one might think, and it's hardly any wonder that Torch should have grumped when its neighbour H/H came up with the lookalike, sound-alike Tiger. In fact there are plenty of differences between the two machines — different secondary processors, for a start — but there are real similarities, too.

Though this is H/H's first computer, it isn't the proverbial two-men-and-a-dog new computer company, but a fairly large and established manufacturer of electronic audio equipment. The Tiger's design was bought in from Tangerine, but the machine has been assembled by H/H. The first prototypes saw the light of day in the summer, but H/H didn't offer the machine for review until it was in production, and the model I looked at is a production version.

It's a three microprocessor computer. A Z80A running at a nifty 4MHz does the main processing and gives access to the inevitable CP/M based business software. That has 64K of RAM, of course, plus a small (0.5K) CMOS RAM used to hold phone numbers and similar rarely-changing information.

There's a 6809 — better known as the graphics-oriented chip inside the Dragon 32 — as an Input/Output controller, with 2K of RAM to itself. And there's a mighty 96K of RAM dedicated to the graphics, with an NEC 7220, a very highly regarded new chip, to control it. This makes for a comparatively speedy CP/M machine with exceptional colour graphics capability built in. There's also a built-in auto-dial, auto-answer modem, which gives access to Prestel, and makes for easy computer-to-computer communications.

Presentation

The Tiger arrived exactly when promised, in two large cardboard cartons, and with a mountain of software. It's a departure from the normal three-box design. Instead, there's a keyboard and processor unit, looking rather like an oversized Dragon or BBC micro, and a separate combined monitor and disk unit.

This is a strange and, to me, rather puzzling choice. It gives the machine a massive footprint, for a start. Even when the CPU/keyboard is pushed as far under the monitor as it will go (it still sticks out a fair bit), the configuration takes up 79 cm from front to back. It's going to need a desk to itself.

The CPU is elegant and low, with a

nicely raked keyboard, but it's too slim to hold any expansion boards. But to be fair, the Tiger comes with most of the extras you might want built in. The drive/monitor unit takes up, if anything, less space than it would if it held a main board and an expansion cage, and the two need to be linked by three separate cables: one for the VDU, one for the disks, and one for the power supply.

All the ports are located at the back of the CPU unit, except for the disk connectors (three, allowing for expansion) which snake from its underside — again, rather BBC-like. There's a cassette port, which is very unusual on a business machine, and once more like the Torch — though on that it's handy for BBC software. There's also the option of a UHF controller, so you could, if you wished, carry the CPU unit home and use it as a home computer. However, the Tiger isn't portable in the conventional sense: the CPU unit alone weighs a hefty 13lb.

Both cases are finished in a creamy beige, and the general design is solid and pleasing. The box even included a 'Tiger Care' impregnated cloth for wiping the computer clean.

The machine has minimal options for expansion — or contraction — at the

'It comes with most of the extras built in'

moment. The dual floppy colour version is standard, though it's possible to add either further 5¼in or IBM-compatible 8in floppies, or a hard disk to it. It comes complete with CP/M, but without any applications software included in the price.

Documentation

Tiger's approach centres around presenting a nicely finished product, with all the loose ends tied up before it hits the market. The Programmers' Manual wasn't complete at the time of review, but the User Guide and Reference Manual both came in a finished form. There's also a very slim document which describes the demonstration graphics programs included on the system disk.

The User Guide is a clearly written effort aimed at putting across the basics to a naive audience. It includes pictures and diagrams, and gives the basic information needed to get the system working. The Reference Manual is aimed at high-level programmers and other more sophisticated users, and contains enough information on CP/M and on the graphics commands to get a Basic programmer

started. Again it's well written, and working from it I had no trouble using the graphics capabilities from Basic. However, it's short on technical information, which is where the Programmers' Guide will presumably come into the picture.

H/H isn't a secretive company: the sales brochure contains a larger colour picture of the neat main board, with all components labelled and described. I went back to them with a few queries, and received clear and lengthy instructions over the phone.

Both these guides are excellent examples of their kind, as are Tiger's software manuals. They are all spiral bound, with appealing and reasonably robust blue covers.

Keyboard

The main keypad is a creamy beige to match the computer casing, while the cursor control/numeric keypad is slightly darker. The ten functions stand out a mile: eight of them are brightly coloured in the eight screen colours. Outside programs they are used for changing foreground and background colours, and it's easy to tell which controls which colour.

There's a sensible, and not unduly expansive, key layout, with caps lock (which locks down mechanically, as on a typewriter — a nice touch) and shift lock (with an associated light), keys in the conventional places, and a couple of extra screen controls. It was disappointing to discover, however, that the entire keyboard is hard, so not even the function keys can be reprogrammed. That is, they can be read by application programs, but they can't be programmed to return a string of commands.

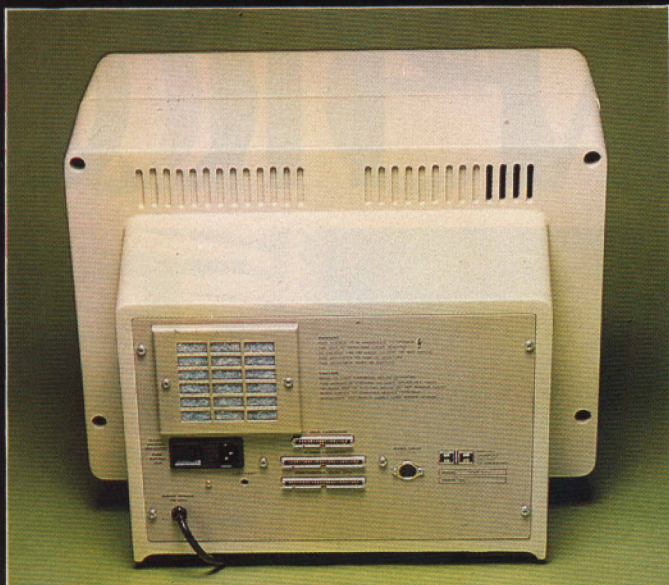
The character set isn't large by current standards, and both hash and pounds keys returned the same code which doesn't generate a pounds sign on my printer. Otherwise, it's a pleasant keyboard with positive feel.

The reset button is sensibly and safely located on the underside of the CPU unit. There's a type-ahead buffer, which worked, albeit sometimes unpredictably, in the word processing package.

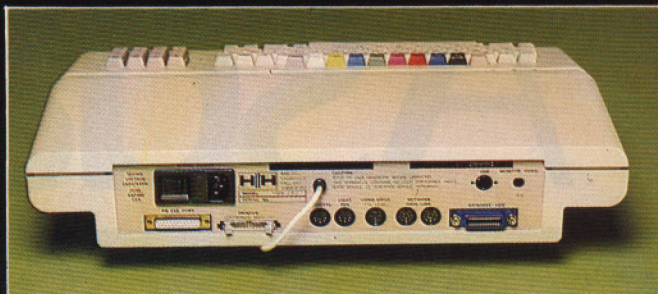
Display

Display is the Tiger's strong point. There's a large and clear 14in colour screen, with the standard eight teletext colours all coming across brightly. This version was reputedly coated with long-persistence phosphor (available as an option for graphics applications) but it behaved quite normally for text and was slightly flickery for graphics, so perhaps this wasn't really the case.

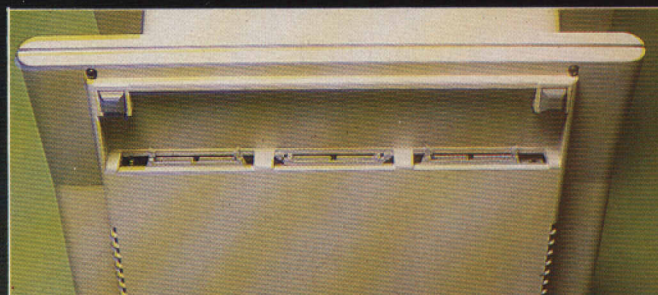
I had no trouble working with my back to a window, so I didn't try to adjust the contrast, which is a tricky business involv-



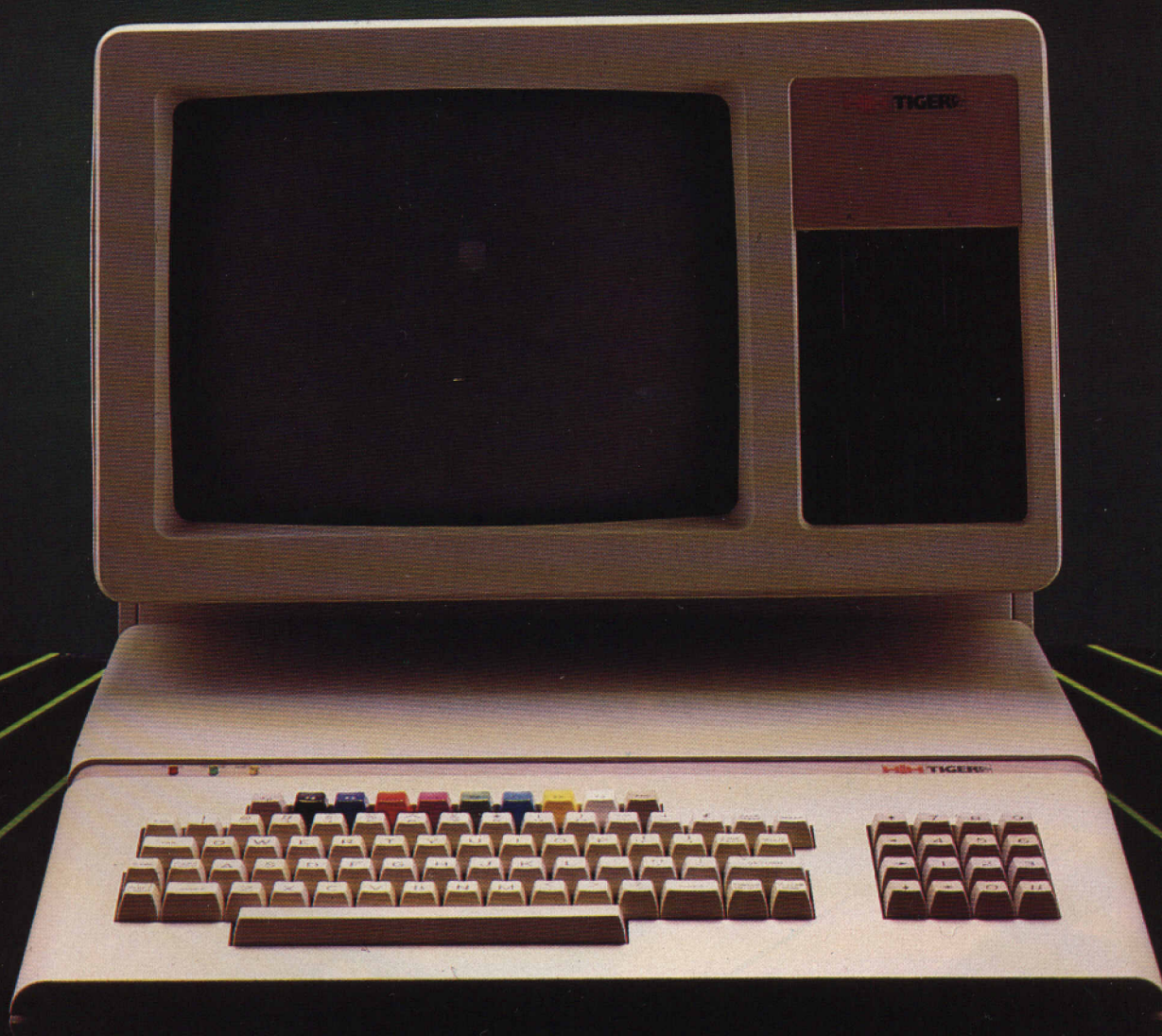
The most obvious visual feature of the Tiger is its large 'footprint' (the surface area occupied on the desk-top). Some of this bulk is apparent in the rear view (above). The colourful function keys are eye-catching (below) but not as interesting as the design might indicate. They cannot be programmed to return a string of commands; they can only be 'read' by the application programs.



The rear of the CPU snuggles in against the combined VDU/disk drive unit — most of the necessary connectors are located here.



The three disk drive connectors are under the front of keyboard.



◀18 ing a screwdriver. No other controls are provided, and the screen can't be tilted, though I didn't find this a problem.

Three modes are available: 80 × 24 text, teletext-type 40 × 24 text, and graphics. The full colour range is available in both modes, and the teletext attributes can be set in either serial or parallel, so there's no need to leave gaps on the screen when changing them, as there is with the BBC/Torch.

The character set is clear and pleasant, and there are mosaic graphics, but no little men, copyright signs or other extras. It isn't possible, as far as I could tell, to redefine or add to the character set.

One interesting possibility is to set up

'The display is the Tiger's strong point'

two displays, one to show graphics and the other to hold a text screen while developing a graphics program. This is quite feasible if a second VDU port is fitted as an option.

In graphics mode a square 512 × 512 pixel area of the screen is used, leaving a large black border. All graphics commands are given by reference to pixel addresses, and the screen is numbered fairly conventionally from the bottom left-hand corner. The graphics commands provided via the 7220 include line and point drawing, circle and rectangle fill and outline, and a rather awkward way of

incorporating text.

There's a pattern register which can be used to fill areas with patterns or to simplify producing intermediate shades, and shapes can be rotated.

The most powerful features are the pan

and zoom commands. It's possible to enlarge any area of the display up to 16 times, and then to pan across giving pixel address to locate the display area. This feature is shown to good effect in the otherwise rather pedestrian demos that come on the CP/M disk. A special graphics demo disk provided some exciting examples.

Naturally, all eight colours can be used at any position on the screen, so there's no difficulty in producing very detailed multi-coloured graphics. All the graphics commands are given by ASCII sequences when in graphics mode, and I managed to access them from the unexpanded Microsoft Basic, using rather clumsy strings of PRINT commands.

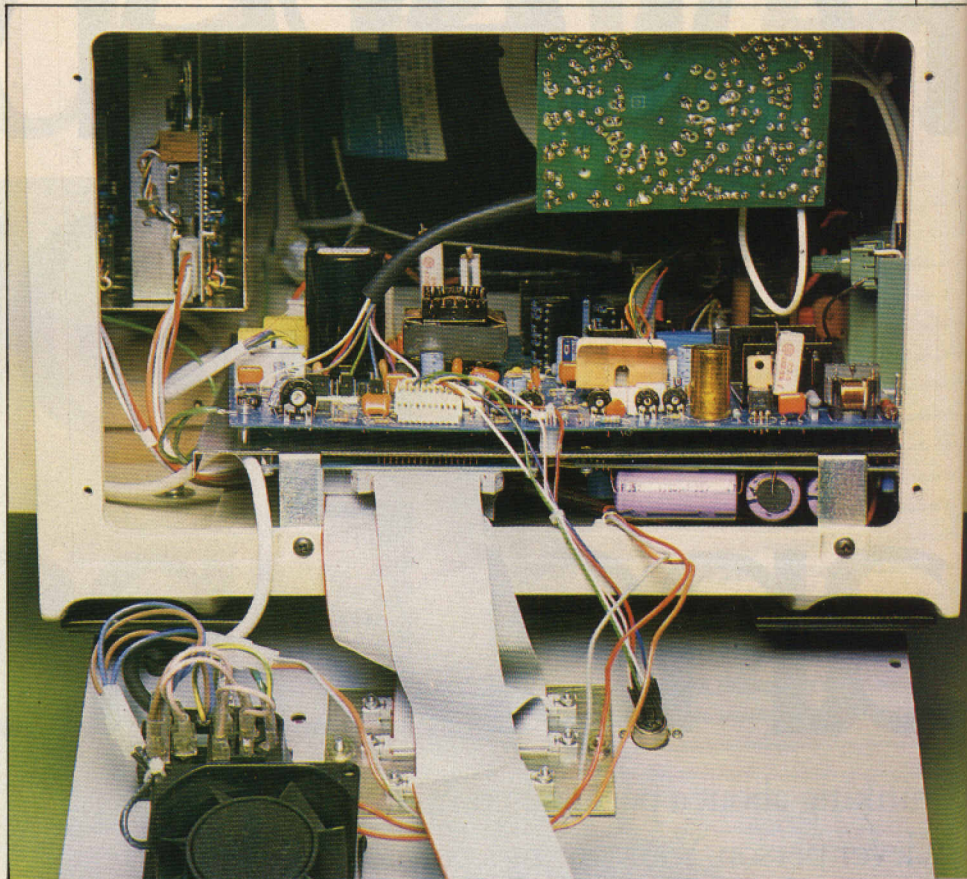
A serious user would obviously need purpose-written software, but this pretty basic method produced displays which were written and updated at a very acceptable speed.

Storage

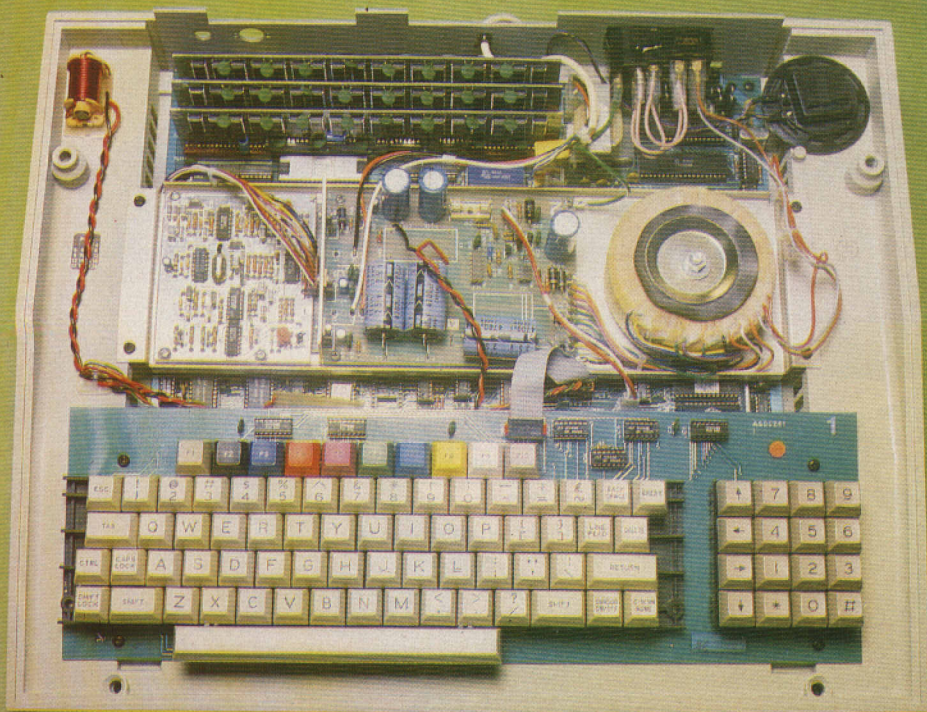
The drives are Mitsubishi-made, and very high capacity: 1 megabyte unformatted, and around 720K formatted. I found them a little noisy during access, but very reliable. The fan incorporated in the display/drive unit was, in contrast, commendably quiet.

Software

Tiger has a very strong policy on software. All the dozen or so packages arrived in Tigerbyte-labelled boxes with Tiger-oriented names on them: Tigerword, Tigercount, Tigerlist and so on. Inside many of them were unadulterated Peachtree manuals with quite different names,



The VDU unit (above) needs a fan to keep the tube and twin drives cool. Unfortunately, the silence generated by the fan can be drowned by the rather noisy drives. The three processors and associated RAM are housed in the keyboard unit (below).



422 but when it came to the floppies Tiger had gone back to work, and every one was neatly wrapped in a sealed polythene bag, and encased in the regulation pale blue and white.

By far the biggest stack was of Peachtree software, including Peachtext, a Spelling Proofreader, Mailing List Manager, Inventory Management, and a complete set of accounting ledgers. Peachtree produces beautiful manuals in cloth-covered ring binders, encased in green library cases. Inside, they are all clearly written and properly anglicised. There was even found an apology when a command demanded an American spelling.

The packages have been properly adopted to use the Tiger keyboard, with clear plastic function key overlays provided for a couple.

The accounting software wasn't tested though it looked very competent: the payroll included statutory sick pay and so on. Peachtext/Tigerword, which I hadn't encountered before, proved to be a pleasant surprise. It has a clear editing screen, good commands, and a lot of power, though it's not quite up to Wordstar standard in handling long documents. The main problem with this — and to a lesser extent with Wordstar — was on the screen handling.

Both packages obviously had difficulty making proper use of the screen memory, and rewrote the screen continually instead of scrolling. Moving backwards in the text was a particular problem. Peachtext swaps regularly between a text screen and an editing status screen, and with 96K to play with it seemed a little ridiculous that it couldn't hold both in memory instead of rewriting on each swap. The rewrites were fairly fast, but not fast enough; the program otherwise responded very promptly.

Tigerplan appears to be an implementation of Sapphire's MARS spreadsheet/management reporting/business graphics system, and this worked well. There was also the inevitable Microsoft Basic, version 5.2.2., and Tiger's own Prestel program which has a few touches that Torch's lacks. No obvious gaps, but the communications software, Prestel apart, is admittedly not yet anywhere near Torch's standard.

All the software packages seemed to be sensible choices, and when I mentioned packages not originally included — Wordstar, BBC Basic — to Tiger, copies of these too turned up in short order.

However, it may be that most would-be buyers will want to know which well-known package Tigerword, say, is, before forking out several hundred pounds.

Tiger is really an applications micro, and languages lag behind business packages, but the Microsoft standards — Cobol, Fortran, Pascal — should all appear shortly, and probably Forth too. As it's a standard CP/M machine and can take programs straight off standard format 8in disks, there should be no problem in obtaining any CP/M software.

Graphics software is obviously crucial.

Digital's GSX package was almost-but-not-quite ready at the time of review, but the well-established mini-based GINO-F was up and running.

A demo came in time for review, with the real thing promised a few days later. As I'm no Fortran programmer (GINO's a set of Fortran subroutines), the demo did fine. GINO covers a wide range of business graphics and CAD territory, and can handle shape mirroring, rotation, scaling, shearing (that is, perspective effects) and 3-D.

The demos worked fast and impressively, and the package should pack enough power to make the Tiger a good choice for designers.

None of the software except CP/M is free, and this is an obvious drawback at a time when bundled software is becoming more and more common. Maybe Tiger will rethink this strategy and offer at least the Basic with the machine before long.

Interfaces

The usual Centronics and RS232 interfaces are standard, and there's also an IEEE 488 — for Winchesters etc — and networking interfaces, a light pen port and the aforementioned cassette port. The latter is clearly an anomaly, and few users will need it.

There's a jack plug to the phone, as with the Torch. You just plug into a suitable phone socket, and tell the computer to get dialling. This makes the Tiger extremely easy to use as a Prestel terminal, and it should be just as good for electronic mail once the software has been developed. In short, a very good range of interfaces which will fulfill all normal requirements.

In use

There's not a great deal more to say about the Tiger in use: when you're not in graphics mode, it's a pretty standard CP/M machine. Nothing amazing has been done to make it user-friendly, though it has some nice touches like an inbuilt clock, the CMOS memory — which can be rewritten after adjusting a security switch — and a commendably short start-up routine.

After the eccentricities and occasional exasperations of the Torch, it has an air of competent solidity about it.

Though business software has been running on 8-bit micros for years — and this generation of packages is very well proven — 64K of RAM does seem a limitation by today's standards, and one which the high-capacity disks don't altogether compensate for. In conventional use, this RAM limitation is far more significant than the extra processing power which 16-bit machines give. The provision of the separate graphics RAM means that a little more than usual is freed for applications use, but there's no easy way to expand the machine in this direction.

Tiger has conspicuously not gone for the virtual disk approach used in some other new machines like the Miracle. The machine works fast, but the need for comparatively frequent (compared to 16-biters) disk access will certainly slow down large-scale applications.

Support

Tiger is clearly going all out for a solid image, carried right through software and support services. The company has appointed around 70 dealers, allocated machines to them, and carried out dealer training before even sending machines for review — a welcome touch in a market where many trumpeted machines aren't even working in prototype.

Both machine and software reeked of quality.

Verdict

Obviously 8-bit colour graphic communicating micros aren't everyone's cup of tea, and with this mix of capabilities the Tiger is markedly more expensive than a very basic CP/M machine, even though it compares favourably with most such machines expanded to support colour graphics.

Tiger would make a superb upmarket executive machine, the Rover of the micro world perhaps, particularly with its Prestel capability. And it has obvious appeal for designers, advertising firms and other people who can make full use of this level of graphics capability.

Not a machine that's likely to take over the micro market, then, but an excellent choice if you're looking for a computer with colour graphics, Prestel, and reliability for mainstream business applications.

SPECIFICATION

Prices (ex VAT)	Standard Tiger incl 2 floppies, colour monitor, graphics and communications capabilities £2,795, 1 MB expansion disk (external) £490, 2 MB expansion disks (external) £775
Processors	Z80A (4MHz) plus 6809 I/O processor (2 MHz) plus 7220 graphics processor.
RAM	64K with Z80, 2K with 6809, 96K with 7220, making total 164K, plus 0.5K CMOS RAM with battery back-up. 62K available to CP/M.
ROM	2K with Z80, 16K with 6809
Text screen	80 x 24 or teletext-type 40 x 24, 8 colours
Graphics screen	512 x 512 pixels, 8 colours
Keyboard	88 keys, in unit with cpu, numeric/cursor pad, 10 function keys
Storage	2 x 1 MB (unformatted) floppies
Interfaces	RS232, Centronics parallel, IEEE 488, networking, light pen, cassette, disk expansion (5¼in or 8in), optional UHF or additional video monitor
Operating system	CP/M
Distributor	HH Microcomputers, Viking Way, Bar Hill, Cambridge 0954-81140

A simple electronics exercise can add sound to your Newbrain. Theo Kampermann is your guide.

Sound on the brain

With the Newbrain now officially back from the dead, owners of the machine should be sure of some support for their micro. But even if the amount of hardware and software available for the micro starts to increase, it is liable to do so slowly.

There are simple add ons you can build yourself, and enterprising Newbrain owners have begun to write their own software. The device described here will allow you to produce simple sounds from your Newbrain, and in the near future PCN will be celebrating the return of the Newbrain by telling you how to write your own word processing program for it.

First, a word of warning. Make sure the series resistor you use is at least 390 ohm, as anything less is liable to damage your printer output. You should also make sure that you get the connections right, and that you make them neatly, avoiding short-circuits. Again, you could do quite a bit of damage, and it may be some time yet before the Newbrain servicing network gets properly cranked up again.

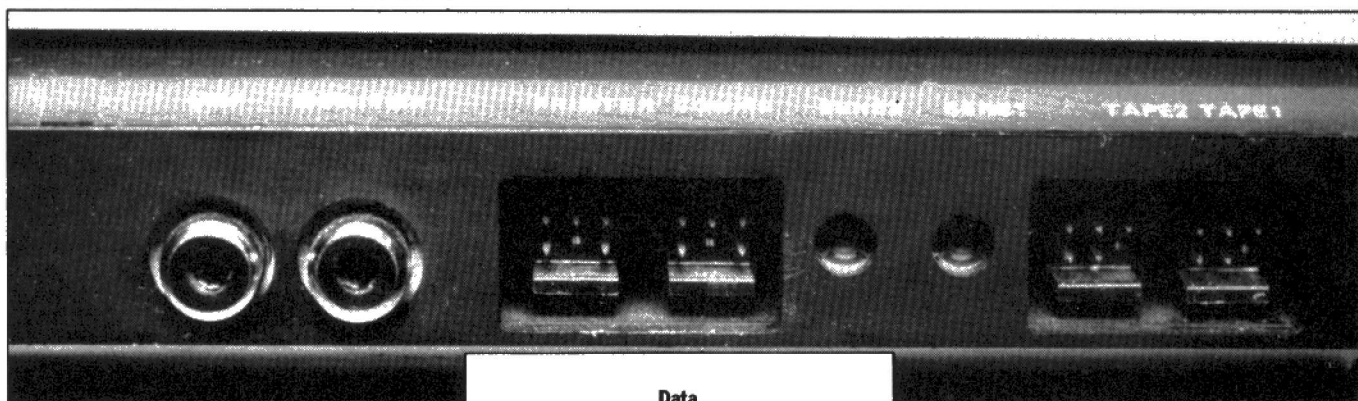
Figures 1 and 2 show the basic wiring diagram. Figure 1 shows how you wire up the circuit with only the 390 ohm resistor, while figure 2 shows the variable resistance/volume control wired in series with the resistor.

The variable resistor should be 0 ohm to

use that. Or you can use the cassette interface cable. Obviously it's best to use a spare, just in case anything goes wrong.

To use the cassette cable, take out the little white pin from the connector so that you can place it in the communications or printer connector. The chassis connection of the Remote plug then acts as connector pin 4, while the chassis connection of the Mic plug is pin 6. You then need to wire in your resistors, making sure you've put them in the right part of the cable, and connect up your speaker. A small 8 ohm speaker of the sort used in pocket radios should fit the bill.

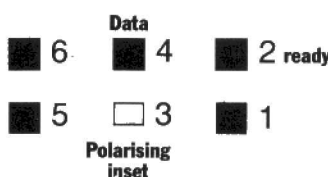
Now you're ready to roll, apart from the fact that you're going to need software to



Even after the recent — and much publicised — problems with the Newbrain, you probably still think your micro was a sound investment. But it's unlikely that you've thought much about getting sound out of your investment. Oddly enough, this is possible, and is also fairly easy.

The way you do it is to use the printer output, hooked up to a small speaker, to produce the sound. You can vary the baud rate on the Newbrain, and if you do this through the add-on device described here, you can vary the notes produced. If you wire it up with only the 390 ohm resistor, the system will still work, but in this case you won't be able to vary the volume level.

However, if you add a small variable resistor you'll be able to compose your masterpieces discreetly until you're ready for a full-blown concert career.



The pin layout of the printer socket

any size you like, although the larger the variation, the easier it will be to fine-tune your volume output. In effect, what you're doing by wiring the two in series is producing a variable resistor of 390 ohm upwards.

Figure 3 shows the pin layout of the Newbrain's serial outputs. So effectively your task is to wire the various bits of paraphernalia up to pins 4 and 6. Connector pin 6 is ground, while 4 is data.

There are two ways you could make the link-up. If you're the proud owner of the legendary Newbrain printer cable, you can

control the notes you play. Try the following subroutine:
60000 OPENOUT #69,8 "1500"
60010 FOR I = 1 TO 100
60020 PUT #69, 169
60030 NEXT I
60040 CLOSE #69

In the above program the 1500 in line 60000 is the baud rate, while 8 is the printer and 9 the communications connector. The numbers in line 60010 specify the length, while 169 in 60020 is the output byte.

In order to vary your output you can play with the baud rate, the number put into the stream and the length of the tone. Using 169 for the output byte gives you many transitions per byte while 0-255 sounds completely different.

With a little thought about the software you should be able to produce quite a number of simple but varied tunes.

FIGURE 1

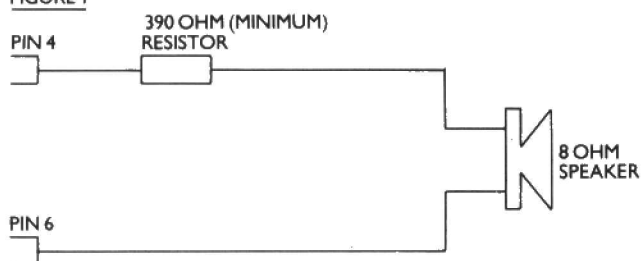
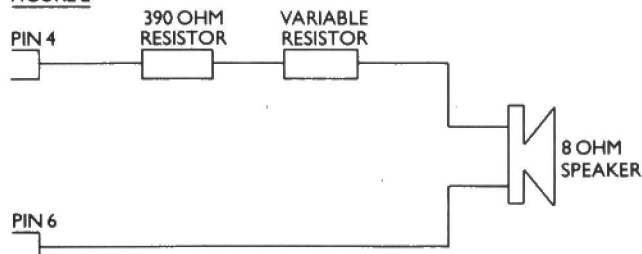


FIGURE 2



Paul Giblett concludes the list of *FX commands on the BBC, begun last week.

Star command



200,n Controls action on memory after an event which is Escape or Break, n = 0-enables Escape key, 1-disables Escape key, 2-Wipe memory between &400 and &7FFF on Break, except for the zero byte of each page. This is useful as a software protection device, as the program will be destroyed.

201,n Controls the Keyboard, n = 0-enables keyboard, 1-disables keyboard, except for Break.

202,n Allows software control of the keyboard mode (and alters the LEDs), n = 0-shift lock and caps lock on, 16-shift lock on, 32-caps lock on, 48-lower case, ie both off.

210,n Controls sound output, n = 0-enables sound generator, 1-disables sound generator — no more monotonous games jingles!

211,n Selects channel number for production of bell tone (CTRL G, VDU 7 and copy when not in edit mode), n = 0-3.

212,n Selects envelope/volume for bell tone. This is controlled from n in a rather complicated manner, as $n = 120 - 8(x - 1)$, where x is the normal volume/envelope parameter in the SOUND command. Thus *FX212,208 will cause bell to be at volume -10. Note if the value in n is not divisible by 8, bell will not function at all.

213,n Selects pitch of bell tone, n = 0-255 as for SOUND.

214,n Selects duration of bell tone, n = 0-255 as for SOUND (remember 255 is continuous!)

219,n Sets TAB key to produce ASCII code n when depressed. There seems to be a peculiarity here, as ASCII codes for capitals produce the lower case equivalent and vice versa. Thus *FX219,65 gives 'a', and *FX219,97 gives 'A'. Non alphabet characters seem to be unaffected.

220,n Sets key which produces ASCII code n to act as Escape ie change escape code from 27 to n. The Escape key will then produce ASCII 27 without escape eg *FX220,69 sets 'E' to act as Escape.

224 Cancels VDU queue. Many of the VDU commands require a number of

following bytes eg VDU23 requires 9. This call cancels the bytes already received.

225,n, 226,n, 227,n and 228,n This group of four calls affects the operation of the red function keys. These keys are able to produce four values each: function key alone, shift—function, CTRL—function, shift — CTRL — function. Normally function keys alone are programmable by *KEY, shift — function produces the Teletext codes 128 onwards, CTRL — function produces the Teletext control codes 144 onwards and shift — CTRL — function is not set. It is possible to set the function keys to produce any character for any of these four. These calls set the base code, that is the code produced by F0 and each subsequent key produces the next code. **225,n** sets the base code for function keys to n (also disabling string storing ability), **226,n** sets base code for Shift-function to n, **227,n** sets base code for CTRL-function to n, **228,n** sets base code for shift-CTRL-function to n.

Note — if *FX4,2 is used to enable the cursor keys as function keys, they will act in a similar manner, but a 'hole' is left at F₁₀ since Shift-Break and CTRL-Break have other special functions.

229,n Sets action of Escape key, n = 0-generates Escape event, 1-produces ASCII 27 only, no Escape.

230,n Selects action on buffers storage on Escape event, n = 0-flush all internal

buffers, 1-Preserve buffers.

231,n Sets action on a 6522 IRQ, n = 0 disables interrupts. These must then be dealt with by a user-supplied routine pointed at by the USERV. n = 255-enables interrupts.

232,n As above for 6850 IRQs.

247,n, 248,n and 249,n These three calls may be used to set a vector through which the MOS will move whenever a Break occurs, ie a jump instruction may be placed here to a user-supplied break handling routine, eg *FX247,76/*FX248,0/*FX249,14 = JMP&0E00. If the user routine ends with RTS the normal MOS break handler will also be executed.

252,n Selects the number of the SWR to be entered after the next Break, over-riding the priority of SWR15.

254,n Selects memory size after next break, n = 0-16K, 255-32K. This is useful for simulating a model A machine.

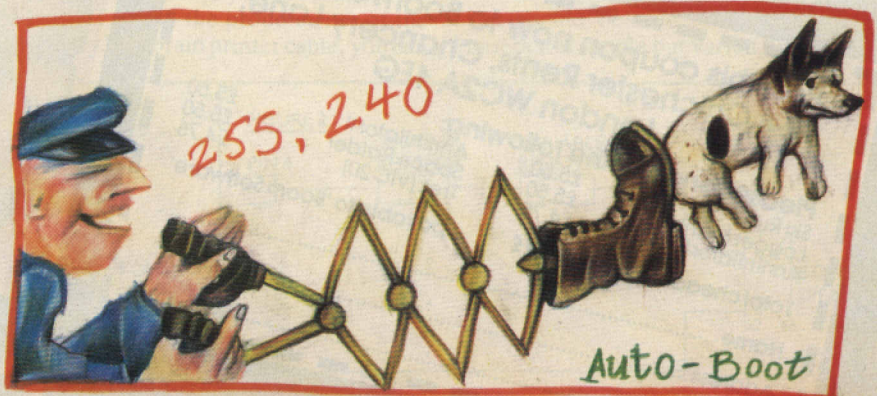
255,n This call mimics the DIL switches at the bottom right of the keyboard (fitted with the DFS). These control several 'start up' options. The byte given as n acts as a 'bit switch'.

Byte	Bits							
n	7	6	5	4	3	2	1	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
Mode	7	6	5	4	3	2	1	0

Bits 0 and 1 are unassigned by Acorn, while bits 5, 6 and 7 control the screen mode entered after Break.

Bits 2 and 3 select the disk drive type, while bit 4 sets the Auto-Boot type; bit set = Auto-Boot on Break, not set = Auto-Boot on Shift-Break. Thus *FX255,240 will select Auto-Boot on Break and mode 0.

This last group of calls will not be reset by CTRL-Break, only a subsequent *FX call or a power down will alter the values.



Ted Ball examines his new Forth computer after changing the Basic for a ZX81-Forth ROM.

New life for ZX81



The ZX81 is a good cheap computer for beginners, but it has many limitations and a lot of people go on to buy another computer after a few months. If you're one of the people with a ZX81 gathering dust in the back of a cupboard you now have an opportunity to give it a new lease of life as a Forth computer instead of a Basic computer by installing the ZX81-Forth ROM from David Husband.

Features

ZX81-Forth is similar to FIGForth and Forth-79 in its fundamental features but follows neither standard exactly. It gives you the usual Reverse Polish Notation and the colon definitions you expect in Forth, but the built-in dictionary includes a mixture of words from FIGForth and Forth-79 — although not the complete vocabulary of either — and it also has some non-standard words.

ZX81-Forth does not give a full standard version of Forth because it is specialised for multi-tasking and there's not enough ROM space to fit in a full standard version as well as the multi-tasking facilities.

Multi-tasking allows you to put in several programs that appear to run simultaneously. Its main use is to control external hardware (remember the early Sinclair advertisements that suggested you could use a ZX80 for running a power station?). What actually happens is that there is a scheduling system in ZX81-Forth that cycles round all the tasks, allowing each one to run for a short time, but this is done so fast that the tasks appear to be done at once.

To make the scheduling more flexible ZX81-Forth includes a real-time clock that you can use when setting up tasks, so you can specify when the task starts and how often it repeats.

An important omission from ZX81-Forth is that it does not allow you to read from and write to input and output ports.

You can include hex machine code in Forth words, so you can write your own Port I/O routines, or you could use memory-mapped I/O devices, but ZX81-Forth would be easier to use for controlling hardware if Port I/O routines were built in.

As well as giving you Forth instead of Basic the new ROM changes several other things in the ZX81. ZX81-Forth uses the ASCII character set instead of the ZX81's old non-standard character set, and you have to type all words in full instead of having single-key entry for keywords.

As well as Slow and Fast modes ZX81-Forth has another, Auto, which starts in Slow mode but switches to Fast if the program takes more than a quarter of a second to execute. There is also a different format for entering and editing programs which uses a split screen, programs being typed into the upper part of the screen and immediate commands typed into the lower part.

Documentation

The documentation is a 71-page manual that gives instructions for fitting the ROM and for using ZX81-Forth.

The sections on using ZX81-Forth are clearly written and include many examples to show how the various features work. Although the manual assumes you will be using a textbook to learn the language it explains its fundamentals in addition to the special features of ZX81-Forth, so you can get started without a textbook. There's a table of contents, but no index or list of Forth words and commands, so it can be difficult to find the definition of any particular word.

Getting started

You can buy ZX81-Forth either as a ROM chip which you fit yourself or in a ready-converted computer. The instructions for fitting the ROM are adequate for anyone with a little hardware experience.

If the Basic ROM is plugged into a 28-pin

socket you just replace it with the Forth ROM. But if the Basic ROM is soldered to the board it has to be unsoldered (very carefully if you want it to work afterwards) and a socket soldered in to take the Forth ROM.

The manual shows what you should see on the screen when the ROM has been installed correctly, and it gives some hints on what might be wrong if the computer does not work properly.

Once the new ROM is fitted you have to learn how to use ZX81-Forth, but it is not difficult with the aid of the manual and a suitable textbook.

In use

The system used for entering and editing programs is a lot more complicated than in ZX81 Basic, but it does not take long to get used to it. The main difference is that programs have to be typed directly into the upper part of the screen, without line numbers, and for editing you use the cursor keys to move the program listing around on the screen.

Programs in ZX81-Forth execute at high speed, generally between 100 and 300 times the speed of ZX81 Basic. It is this that makes multi-tasking possible, and you can have about ten background tasks running before the screen display and the response to the keyboard become too slow to make it feasible to type in more.

Reliability

I couldn't find anything wrong in the actual Forth, but there are two problems with the editor. The first is if you insert characters into a full program line you will lose the same number of characters off the right hand end of the line instead of having them move to the beginning of the next. The second problem is that it's not possible to backspace past a space in the lower part of the screen.

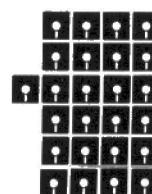
Verdict

ZX81-Forth is non-standard, but its basic features are close enough to FIGForth and Forth-79 to make it easy to use if you are used to one of the standard forms, or to move on to a standard if you start with ZX81-Forth. However, its multi-tasking capabilities make it more useful for converting the ZX81 into a hardware controller than for learning or using Forth.

The ROM is well worth the price if you have a practical application for it, or even just to get some more use out of a superannuated ZX81.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall value



Name ZX81-Forth **Application** Programming language **System** ZX81 with 16k RAM **pack Price** £28.75 **Publisher** David Husband, 2 Gorleston Road, Branksome, Poole, Dorset BH12 1NW **Format** EPROM

David Janda tries out an Oric extension monitor, and examines its relative excellences.

Every micro user at some time may wonder how the machine works — what's going on inside the thing? The best way to discover this is to use software that is designed for that purpose: assemblers, disassemblers and toolkits.

The Oric-1 has a number of utilities available, some of which were reviewed by Max Phillips in *PCN*, issue 25. As can be seen, not all of them made the grade, indeed some would hinder rather than help you.

At the last PCW show, I had the opportunity to meet members of the Tangerine Users Group (TUG), who were showing off some software from a company called Kenema Associates. One of the pieces of software was the Oric-1 Extension Monitor for the 48K Oric-1, which they claim 'is the most powerful extension monitor for the Oric-1'. After using the product for some time, I am inclined to believe that their claim is true.

Features

The Extension Monitor (Exmon) is a machine code utility which enables you to test and debug machine code programs. The package consists of a number of commands for testing and debugging machine code, a 6502 disassembler and a hexadecimal/decimal calculator, all of which takes up only 6K.

There are a number of memory display and modification commands available and it is possible to alter registers as well as RAM locations. As for altering RAM, a number of commands are allocated to this task. First it is possible to display single bytes and, if you wish, alter them. The memory fill command will enable you to fill a block of memory with a hex value between 00 and FF. It is also possible to use the command to fill an area with an ASCII string starting from the first location pointed to.

Memory search is also catered for, and it is possible to either search for a byte string or a character string. Once found the address will be displayed and pressing a key will continue the search. At this stage I should mention that pressing the escape key normally terminates the command being executed and control is returned to the command mode where a > is displayed.

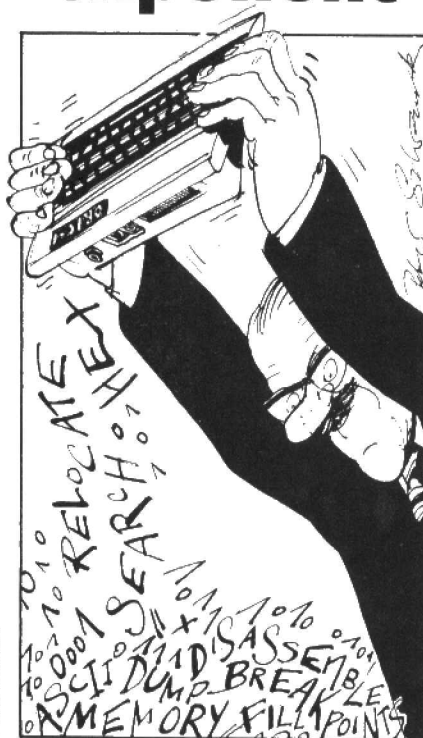
Memory move and memory relocate are also catered for, but with memory relocate care should be taken as the code to be relocated may contain data which may be interpreted by the relocate subroutine as 6502 instructions.

The debugging commands are varied. There are commands which run machine code programs and set breakpoints. Up to eight breakpoints may be set (in RAM only), and when a machine code program is run any breakpoint that it comes across will halt the program and display the breakpoint address, A,X,Y,K,P register contents, breakpoint number and a disassembly of the instruction at the address. Pressing C after a breakpoint has been reached will continue the program until the end or another breakpoint.

Single step is provided and it has a number of variations as do most of the Exmon commands. The result of using the single-step command is a display similar to that seen when a breakpoint is reached, but with the addition that the next instruction to be executed is disassembled if at a breakpoint.

Also, two types of listing may be used, a hex/ASCII dump, or a 6502 disassembly. With both of these commands it is possible to display continuously or within a specified range.

Exmon exponent



Peter Schrank

A feature not normally found in many monitors is a hex/decimal calculator. The one in Exmon allows you to perform simple arithmetic in the two bases, including integer division and remainder.

Presentation

For your money you get the Exmon cassette, which is in one of those book-type cases, and a shoddy-looking 14-page manual. The cassette contains two copies of Exmon on one side, both of which loaded first time.

The manual is printed on wafer thin, off-white paper and like the print it's small. The whole affair is held together by two staples and lasted for a few days before it fell apart. This is a pity because the content is quite good, with each of the commands clearly discussed together with any variations.

In use

Setting up Exmon is simple enough. No setting of HIMEM is necessary as the

program does all this for you.

Once the program auto-runs you are greeted with the Kenema logo and the command prompt '>'. The top line is reserved as a status line and displays the capitals and printer status. Both can be toggled by using controls T and P respectively.

Using the commands was no problem and I didn't discover any bugs. The memory dump and disassembly were quite fast and so was the relocate. I do have two major grumbles about the package.

First, for the price (£15), I would have expected a two-pass disassembler, not a single pass as this package offers. These are not the easiest of things to implement and they still do not distinguish between data and commands completely, but they are very useful. Also a little intelligent error-checking would not go amiss; it is possible to accidentally overwrite the monitor or your own code using the relocate or memory move commands.

Secondly, the user interface could be cleaned up a bit. For example, when you execute a hex listing, an address followed by 8 bytes follows together with the ASCII representation is displayed. This looks nice and neat, but if you specify an end address which is equally divisible by eight then the dump will finish somewhere on the last line immediately followed by the ASCII dump. In other words it can look messy. Also, when you specify a hex dump or disassembly which will take up more than one screen you can't stop it by using the escape key.

All the commands for Exmon are entered as a single letter followed by parameters (if applicable). Generally the syntax checking for entering commands was quite good, but there were occasions when entering a command followed by too many spaces would normally result in the wrong address being disassembled.

Verdict

On the whole, Exmon was reasonable. It has a large number of commands that will no doubt make the machine code programmer's life a lot easier. The way the program is organised is simple yet effective, with single letter commands a blessing. But for the price it could offer more, and if it were a fiver cheaper it would offer *real* value for money.

Name Exmon System 48K Oric-1 **Price** £15
Publisher Kenema Associates Ltd. **Format**
Cassette **Language** Machine code **Outlets** Mail
order, dealers.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall value



Two health and diet packages get a thorough check-up from Mike Gerrard and a nurse.

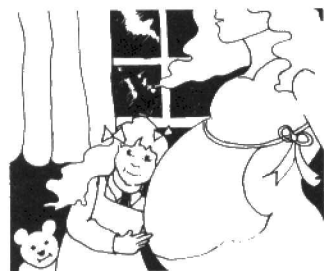
Good health!

We've been accustomed to thinking of home software in terms of games and adventures, with a smattering of programs of a more or less educational nature thrown in for good measure, but there is a range of totally different material now becoming available for the more popular home micros, as indicated by the recent batch of health and diet programs for the 48K Spectrum that came PCN's way. Now an ability to get a high score at Manic Miner is all very well for a games reviewer, but it wouldn't get him very far with this type of software, so I also consulted a friend, an experienced nurse. Her comments are in italics throughout.

Cycle Planner / Growth Tracker comes as those two separate programs, the first helping a woman keep track of her periods and the second a guide to the health and growth of a baby.

Growth Tracker has a database of information for a week-by-week guide to a typical 40-week pregnancy and a monthly guide to development over the first two years of life, each entry comprising just two or three sentences. Each entry can be displayed separately, or you can see a range of entries or the whole database.

There are both virtues and vices in simplifying things in this manner, and while the publishers do point out that their information is only based on averages, it seems to me that the vices outweigh the virtues. It could be worrying for a parent to read, for instance, that at 12 months the child 'can walk



unaided', and at 20 months it 'can use 10-12 words'. Such are the variations in child growth that these assessments might not be true of a perfectly normal child, and parents would surely be better advised to consult a

more comprehensive book than rely on such brief unexpanded information.

I would question some of the information the program gives on childhood illnesses. In the symptoms for measles it says that tiny white spots called Koplik Spots are seen in the mouth. That is a very rare occurrence, and someone reading that might see there were no spots in the child's mouth and not realise it was developing measles. I can't really see this program as being much more than a novelty. Why buy it when you could get comprehensive books at half the price?

I assumed from the title that Dieta would be one of those handy guides helping weight-



watchers to calculate their daily calorie intake, but in fact it is much more complicated than that. It works out the calorie and fibre content of cooked meals from the ingredients that you input, and will suggest possible modifications to the recipe to reduce the calories. It didn't get off to a good start as the pages of information in the program were full of punctuation mistakes.

The menu offers eight options, so I selected 'Entering Ingredients' to see how it worked. I got my favourite rice pudding recipe to see how it might be made less fattening. After entering the name of the recipe and the number of people it serves, you enter the number of ingredients. Any eggs? it asks. No. Any cooking fat? I hope not. There was a worrying note at the top of the screen: 'Remember to use calories per oz units if your weight is in oz and calories per grams if your weight is in grams.' This was getting complicated.

'Enter name of next ingredients,' I was told, which puzzled me as I hadn't entered any

yet. I tried the first ingredient, milk, which seemed to satisfy the program. 'Enter weight of ingredient.' Obviously pints and tablespoons were not going to be accepted, and I wondered why the program didn't include a weights and measures guide. My cookbook said that one pint was 20 fluid ounces, so I entered that, only to be asked: 'Enter calorie per unit weight for ingredient.' But I've no idea. Aren't you meant to be telling me information like that, dear program?

In other words, you need a calorie counting book in order to make Dieta work, though to be fair to the program it does do what it claims to do and works out the calories per person for a recipe and suggests possible alterations. Some of them seem rather obvious, though, such as using smaller size eggs or sugar substitutes instead of sugar.

The calories you'll save are hardly worth the effort. Most people know what to eat and what not to eat if they want to lose weight, and you can work out your daily intake on the back of an envelope with the help of a calorie book without going through all this performance.

A more substantial program is Diet Master, one of a planned series to include Exercise Master and Heart Master, and comes with a 32-page booklet. This one 'is designed to help you and members of your family learn how to manage your diet, so that you receive a balanced intake of nutrients



according to your needs.'

The program begins by asking your sex, age, and type of occupation. It then prints out for you your RDA (Recommended Daily Allowances) of various nutrients: vitamins, calcium, iron etc. You then have three options, the first being to locate your weight range, provided you're 18 or over. You

could also elect to plan your day's food intake, or simply start the program afresh.

The first option draws a graph showing whether your weight is in the desired range. When I 'accidentally' told it I weighed 1500 lb it informed me that I would have to refer to the booklet. Nothing further appeared on the screen, so there was nothing for it but to reload.

The second option allows you to input food and drink from a three-page list in the booklet, the computer calculating the nutrients contained in the amounts you state. Bar graphs are then drawn to show how this measures up to your RDA. As with Dieta, this seemed to me to be a needlessly complicated way of doing things.

I wasn't sure if the program was meant to be about losing weight, or about nutrition. If it's about nutrition why does it specifically exclude the most important categories: pregnant women, lactating mothers, babies and growing children? Why does it say it's designed 'to help you and your family' when it points out a few paragraphs later that babies and children under nine are excluded, and calculating the weight range is not for anyone under 18?

The range of foods the booklet covers is also very limited. You'd be much better off buying a calorie counting book that tells you how many calories in a tin of Heinz baked beans compared to other brands etc. — something really comprehensive

Dieters would be better advised to get calorie counting books or free leaflets from Health Clinics or get free expert advice from dieticians and health visitors.

This batch of software doesn't come up to scratch, then, from either a programming or health point of view. Can you do it better with pen and paper? If you throw in a visit to a bookshop, Health Clinic or your GP, the answer is definitely Yes, you can, and at a fraction of the cost.

Cycle Planner/Growth Tracker (£7.25), Medidata, PO Box 26, London NW9 9BW
Dieta (£5), LC Dunbar, 14 Ribbles Close, Culcheth, Warrington
Diet Master (£6.95), Delta 7 Software, 11 Claremont Drive, Headingley, Leeds LS6 4ED.

Brendan Lewis plugs into an Apple-compatible development and control system.

Core of a new Apple

The U-COM 2 is aimed fairly and squarely at the Apple II enthusiast (and the technically proficient enthusiast to boot). It's a development/control system which enables you to incorporate many of the add-on and expansion-card products destined for the Apple II micro.

The U-COM II can also be used as a network controller with BBC micros and Apples using a single disk drive. What you see in the picture is what you get — no keyboard, screen or any storage devices, but the system will hook up with almost any ASCII keyboard and any standard monochrome monitor.

Presentation

The review system came in two small boxes containing the motherboard and the U-COM 2/40 optional 40-column video display card. Inside the boxes were padded with foam preventing the boards from moving about. After sifting through the foam I found a free piece of aluminium foil covering the bottom of the boards.

The two boards were packed inside one bigger cardboard box with more pieces of foam to prevent the boxes moving. Overall it would be safe to send through the post.

Documentation

Don't for a second think that this system is designed for the beginner; without previous experience the user is going to have a hard time. The manual is produced for the engineer, which really is what you would expect of a system such as this as its main uses would be for development of hardware and software (normally for control systems) for either the Apple II or the U-COM II in a control environment.

The manual contains two pages of introduction and general information, and then takes off with in-depth descriptions of how the hardware functions. Then comes a set of various data sheets, timing diagrams, a memory map and finally a full set of excellent circuit diagrams. It should be said that, if you do want to use this system than a full set of Apple II manuals is essential, especially the Apple II Reference Manual.

Construction

The construction of the motherboard and the 40-column boards themselves is very good, but the construction of a full system based around the U-COM II is almost infinitely flexible. Basically it depends on what box you want to put the boards in.

A monitor plugs onto the end of a phono connector lead sticking out of the video board. The display is 40-columns black and white when using the U-COM II/40 video card. The card itself uses a 54 way connector (as opposed to the standard 50-way connector used by the expansion slots) on the front right hand side of the

board. The socket on the board has a stopper about halfway along it to prevent any of the normal expansion boards being placed there.

The information on the screen is clear with only a very slight wobble. As with the Apple II the display is upper case only. This may cause trouble for some users, but on the whole is perfectly all right. The video modes are also the same as the Apple with reverse video and flashing modes.

As for storage facilities, neither disk nor cassette interfaces are provided with the system, which shows up one of the differences between the Apple II and the U-COM II. Though rarely used the Apple II does have a cassette interface built on board, whereas U-COM have omitted this feature because of the small amount of use it gets. Disk facilities are exactly the same as on the Apple; using the Apple II disk controller card, two disk drives can be plugged in per controller.

Expansion

This is obviously one of the main areas where we find out just how compatible the U-COM and the Apple really are.

As you probably know, the Apple II has a set of eight expansion slots at the back of its board into which various expansion boards can be plugged. These include serial and parallel printer interfaces, language cards, memory expansion boards, colour video boards, analog to digital and digital to analog converter cards, 80-column cards, Z80 cards and of course the disk controller card. You will be happy to know that the U-COM II will accept these boards and others, including a few of their own.

As with the Apple there are some restrictions on what board can go in which slot. For example with the Apple II the colour card must go into slot 7 for hardware reasons. This is not the case with the U-COM, but their U-TERM/80 80-column video board must be plugged into slot 3 for software compatibility. With both systems the language card must be plugged into slot 0 and the first disk interface would be plugged into slot 6. As with the Apple the U-COM has eight expansion slots.

The only connections to the board other than the expansion slots are for keyboard, speaker, power supply unit, 40-column card and the games adaptor. The Apple offers video out and cassette connectors which, as mentioned, are not required on the U-COM. The big advantage of having a full hardware manual makes it very simple for design and development of your own add-on pieces of hardware.

Operation

The system, because it is Apple compati-

ble, almost predictably uses the Apple DOS 3.3 as its operating system. This is automatically booted from the disk on power up in much the same way as Apple's autostart ROM does. Because Basic is not present in ROM you have to load a copy of Applesoft Basic into a specific area of RAM. The manual describes how this is to be loaded at D000 in the memory map. Although Basic is not required it is useful for simplifying software development.

After opening up the boxes and looking at the boards, the next thing to do is to work out how to set it up. I was using an Apple power supply and keyboard, so after putting the board on a piece of foam (to protect it from shorts) I set about the task of connecting the bits together. After connecting up the keyboard and speaker I was all set to connect up the power supply.

Beware if you are using an Apple power supply, you're going to find it pretty difficult to connect it up to the U-COM. Although the PSU connector is of the same type and the pins are arranged in the same way, the U-COM connector is too big for the Apple PSU to fit. This leads to one of two options: you obtain a U-COM power supply, or failing this, you build yourself a set of interface cables (stick some wire into the Apple connector holes, solder a few pins onto the other end and you've got interface cables). The only problem with this is that you have to be very careful how you connect these cables, especially if you only have one colour cable.

I finally managed to connect up the board to the PSU and switched on. Beep went the speaker and up came the U-COM banner and a hash monitor prompt. After reading through the Apple manual for a few minutes I was confident of trying a little machine code using the monitor. Within a few minutes I found that it was exactly the same as using the Apple and very easy to use.

Display contents of memory:

```
#100
$0100:FF
#.110
$0101:F7 E0 FB E8 9B 3F 98
$0108:8C CC E8 D8 EC BD EC EC
$0110:EF
```

Change contents of memory:

```
#100:00
#100
$0100:00
```

An interesting feature of the monitor is its ability to display contents of memory in assembler form:

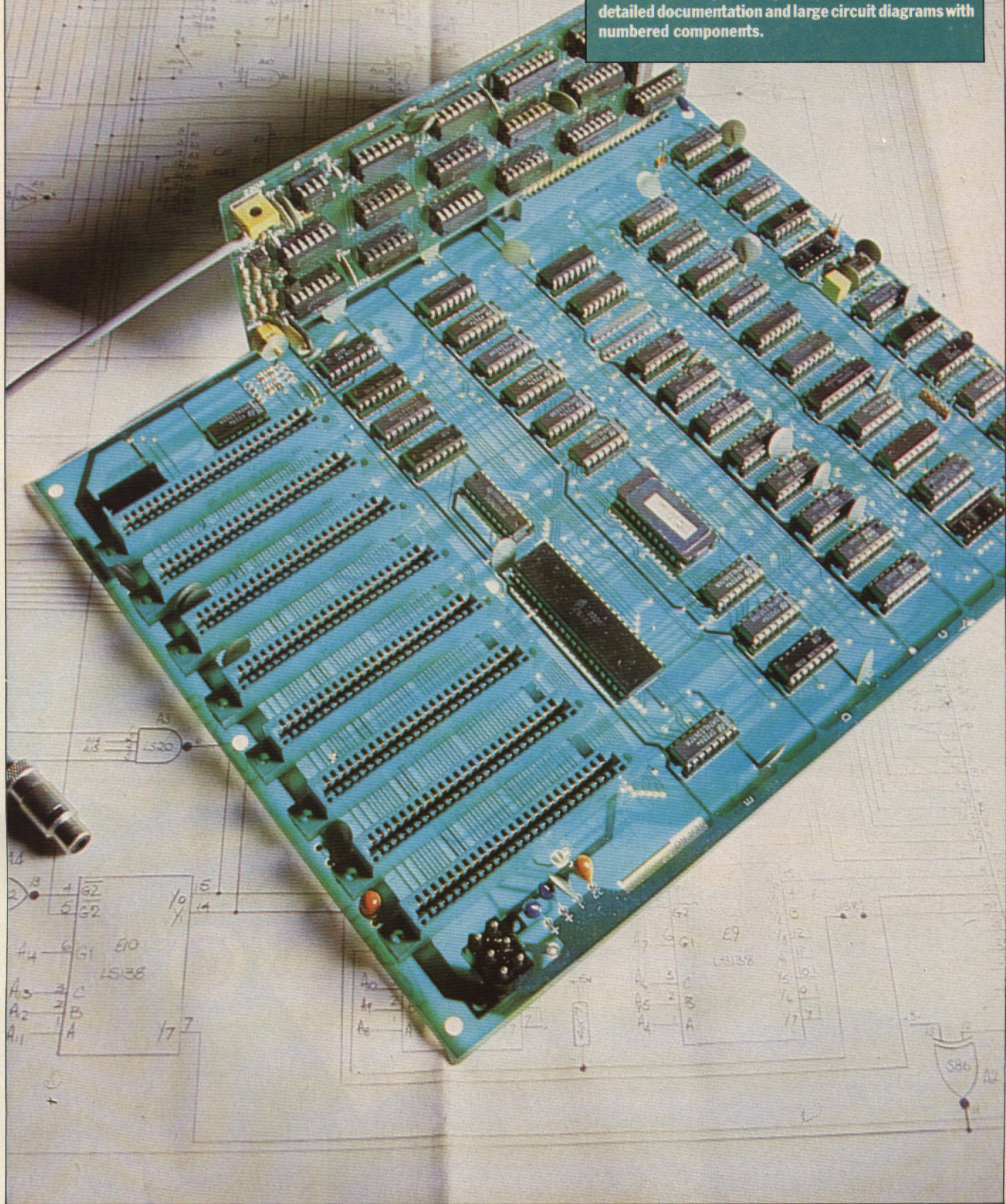
```
#0100L
```

This instruction prints out the contents of memory from 0100 to 0124 in the form:

```
$0124:E0 B3 CPX #B3
```

The one thing missing from the monitor,

The U-COM comes with a 40-column video display card, lots of expansion slots and Apple compatibility. As befits a development system, it also comes with detailed documentation and large circuit diagrams with numbered components.



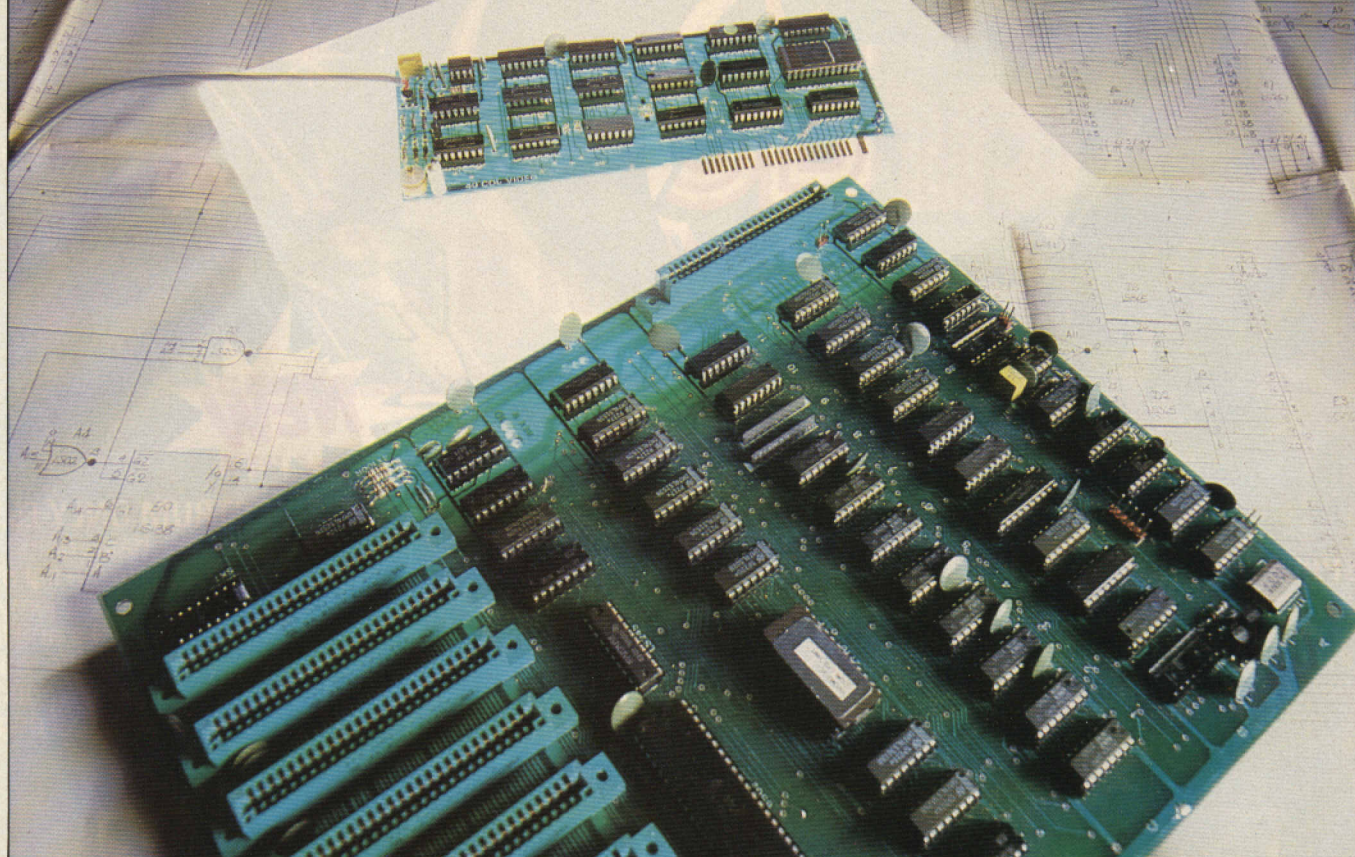
which would be very useful for machine code programming, is a mini-assembler which is present on early Apple IIs and missing from the U-COM monitor.

The next thing on the agenda is using the disk. The U-COM manual says that a disk must be made up that loads a copy of Applesoft at location D000 in memory, but

the problem with this is that you really need Basic to load the program from disk to memory. Apparently, there's a disk which loads Basic and gives a number of utilities such as copying files and disks. It wasn't available for review, but it's apparently similar to any systems disk and with any system.

I then went back to connecting the system up and, to my horror, when I switched on all I got was a high pitched squeal from the PSU. No beep from the speaker and no display. I promptly switched off and started work on repairing the board. The manual is of little use for the first time user, but when it comes to repair

The video card provides upper case only, like the Apple itself. Video modes are also Apple-like with reverse video and flashing modes



◀41 it's a dream. Large circuit diagrams with numbered components make it very easy to work on the boards.

Without the video board installed the speaker beeped and all seemed OK. This narrowed the problem down to the video board, which I traced to one particular chip. After replacing this component the system worked perfectly once more. Relieved, I tried to use the disks, but to no avail.

Perhaps it needs a small machine code program to first load Basic.

An interesting feature for use when video is not required, which is the case in a lot of control applications, is the limited input/output using the games adaptor socket. This allows for control of:

- 2 variable resistors (potentiometers)
- 4 light emitting diodes (LEDs)
- 3 on/off switches

The potentiometers can be used for fine tuning of analog variables while the LEDs can be used to monitor the system in a working/not working way. The switches could be used for choosing program options to control the flow of operations.

Software

Again, because the system is Apple compatible, the range of software available is extensive and (as mentioned in the

introduction) U-COM have a system controlling a network of BBC micros and Apple micros sharing the same disk. This type of system fits perfectly into this part of the market, where a full micro system with keyboard and video would be wasted.

If, on the other hand, a full system was required it would take little time and money to obtain it, and all the advantages of being Apple compatible would be clear. Both Fortran and UCSD Pascal have been tested on the system, both require a 16K RAM card in slot 0. The CP/M operating system is also available with the addition of a Z80 card (U-COM produce the U-Z80 card) in any slot and also a 16K RAM card in slot 0 if a full 56K system is required. Both the languages and CP/M will boot from standard disks.

Verdict

At £249 for the motherboard, £39 for the 40 column card and £71 for the PSU the U-COM 2 is a good compromise when a full Apple system is not required. It is ideal for development work, especially hardware development, as the manual is very thorough when it comes to the hardware side. Because of this it would be ideal for the electronics and computing sections of an educational establishment.

Maybe something should have been mentioned in the manual about the utilities disk which would normally be provided with the system. Also, if more information were given about the software and usage of the machine it could make a viable product for users who are not technically minded.

SPECIFICATION

Price	Motherboard £249, 40-column board £39, PSU £71
Processor	6502
RAM	64K
ROM	2K monitor ROM
Text screen	40 × 24
Graphics screen	Low-resolution — 40 × 48, high-resolution — 280 × 192
OS/Language	Apple DOS 3.3/Applesoft Basic
Other languages	UCSD Pascal + Fortran available on disk
Distributor	U-Microcomputers Ltd, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire WA2 8PR, 0925-54117/8

PCN

micropaedia

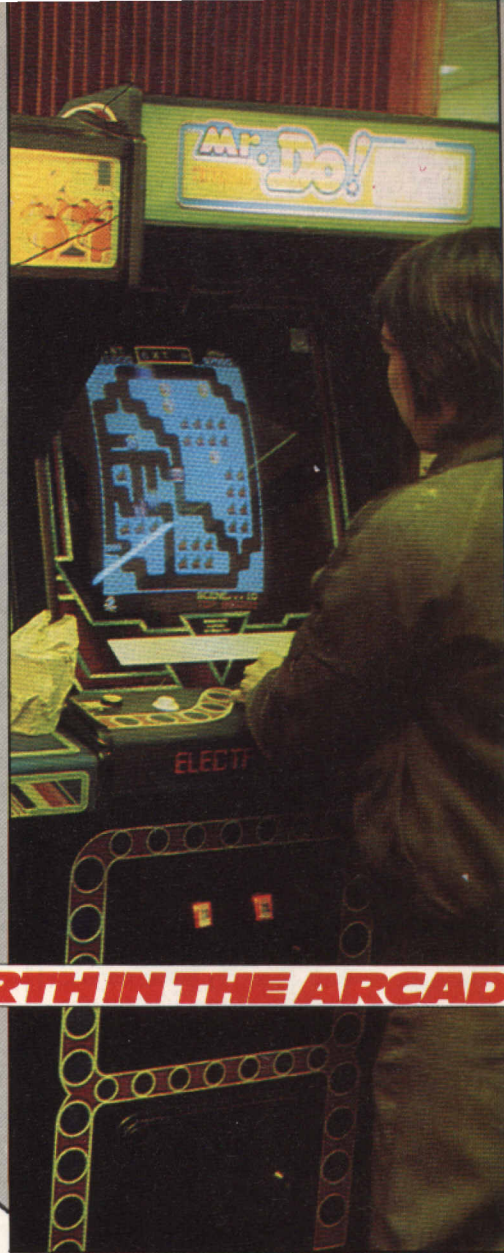
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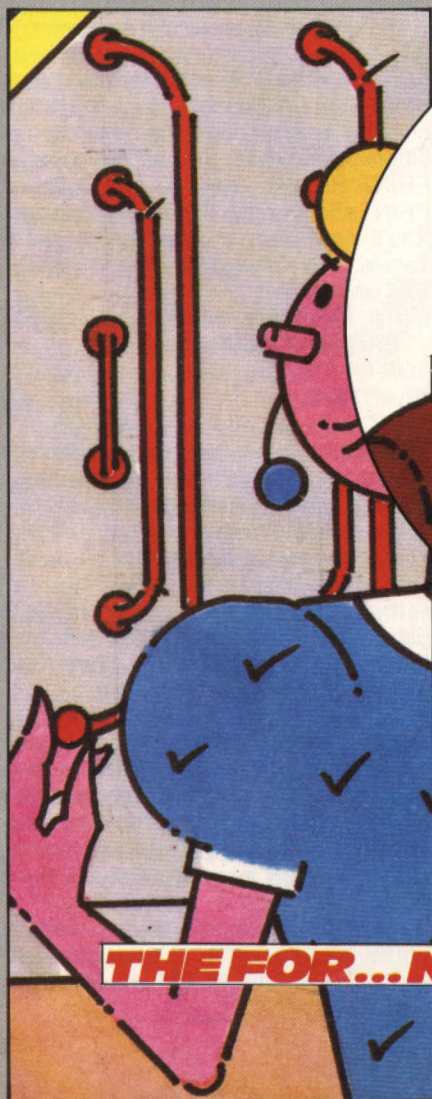


AIMING FOR ADVENTURE

In Part 7 of Everything You Always Wanted to Know About Programming ... But were Afraid to Ask, we find our way out of Forth, notice what's NEXT, analyze adventure games and peruse through Pascal.



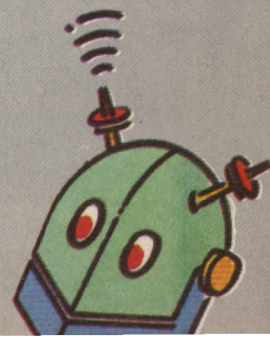
FORTH IN THE ARCADE



PROGRAMMING WITH MR PASCAL

PULL OUT
AND KEEP

THE FOR...NEXT PHONE



So long as these aren't negative or zero, you can use them to get the names from RM\$.

The compact version of this is a bit hard to follow *eg* RM\$(RM (IR,1)) but this can be broken down, as in the next example.

You really ought to design a screen layout at this point, so as to plan the exact whereabouts of those various pieces of information the adventurer will need to know. Because screen handling, even size, varies so much from machine to machine, we'll stick to straight PRINT statements.

What you'll need is something like this:

```
a. PRINT "YOU ARE IN "; RM$(IR)
b. PRINT "YOU CAN GO TO:"
c. FOR I + 1 TONE: REM FOR ALL EXITS
d. IF RM (IR,1) = 0 THEN GOTO i): REM
   NO WAY OUT HERE, SO 00 NEXT
e. PRINT I, ""
f. R = ABS(RM(IR,I)): REM TAKE ABSOLUTE
   VALUE FOR ROOM — BARRIERS ARE NEGATIVE
g. PRINT RM$(R): REM PRINT "NAME OF ROOM"
h. IF RM(IR,I) < 0 THEN PRINT
   "(BARRED)"
i. NEXT
j. RETURN
```

Obviously you will want to play around with the exact messages and their format but note you must trap both zeros and negatives — hence the ABS in the example.

The next thing to do is put items in the various places. This is where things get a bit tricky. There will have to be an upper limit to the number of items in a given location; if the adventurer takes or leaves an item keep track of this in two arrays — one for the player and one for the rooms. You won't want to repeat items — if one has been placed in a room, it can't then be placed in another. If the player loses something you might want to return this to the list of 'available' items and so on.

It might prove useful to place a value on each item in case you have any selling, buying etc and you might want to give each object certain qualities which will limit the uses to which it can be put. All these must be decided before the planning of how to represent this in the computer is done, because it will prove almost impossible to make many modifications to the integrated whole once all the parts are brought together, without producing bugs.

Taking these points one at a time then, first give the objects names:

```
OB = 10 : REM NUMBER OF OBJECTS
DIM OB$(OB) : REM OBJECT NAMES IN
OB$():—() REFERS TO AN ARRAY
DATA KNIFE, FORK, SPOON, FLANNEL, WATCH ... : REM MUST BE
OB OF THESE
FOR I = 1 TO OB
READ OB$(I)
NEXT
```

If you want to give objects values:

```
DIM OV(OB)
FOR I = 1 TO OB
OV(I) = RND (100)
NEXT
```

You may want to be more specific about the value of each item so would have to replace the above with something like:

```
DIM OV(OB)
DATA 10,5,67,9,6,99 ... : REM OB
VALUES
FOR I = 1 TO OB
READ OV(I)
NEXT
```

To economise on program space, you might like to put the value of each item in the DATA statements with the names:

```
DIM OB$(OB), OV(OB)
DATA KNIFE, 10, FORK, 5, SPOON, 67,
FLANNEL, 9 ...
FOR I = 1 TO 10
READ OB$(I), OV(I)
NEXT
```

This technique can be extended to other routines which deal with other aspects and it certainly makes the program easier to follow. All or some of these items must be put in an array to show the location they're in. MN will be the Maximum Number of Items in a room, *eg*:

```
MN = 3: DIM OI(NR,MN) : REM
HOLDS REF. NUMBERS OF
ITEMS IN A GIVEN ROOM
```

At this point you should check that your micro's implementation of Basic allows you

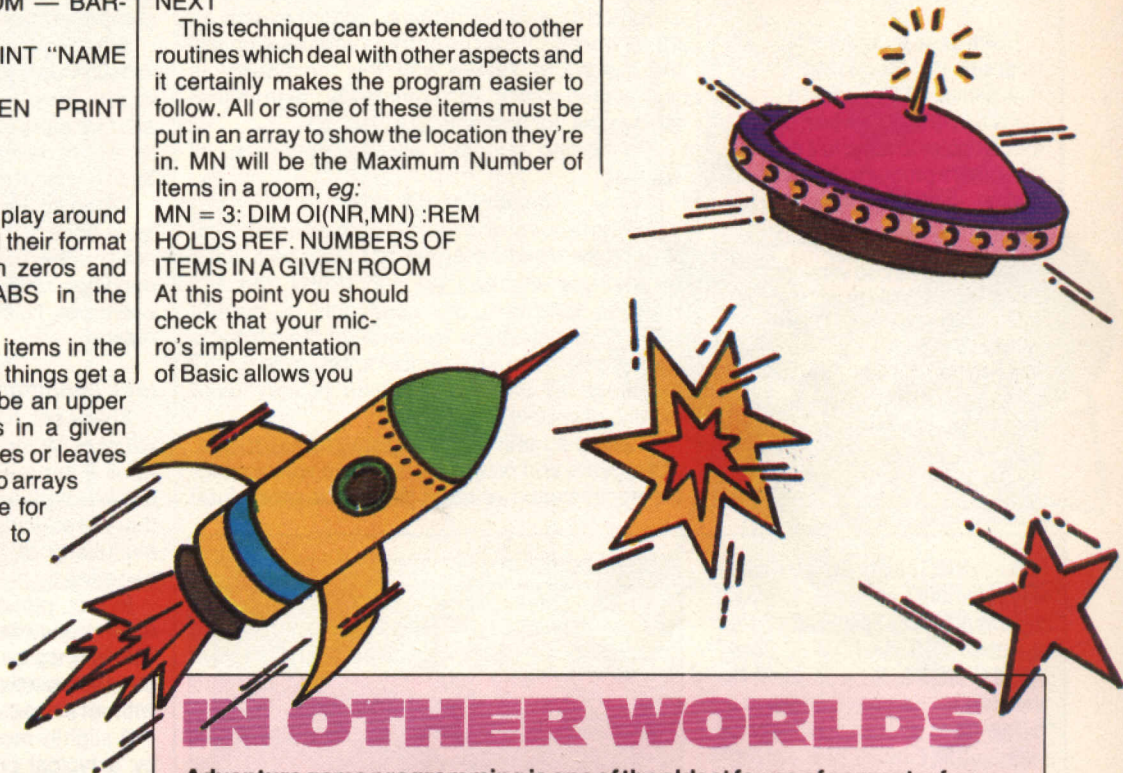
to access column zero of an array. Run the program so far and then enter as a direct command PRINT OI(1,0) — if you get an error message you can't. This column (column 0) is used to hold the number of items in a given location. If you can't access it, you'll have to change the DIM OI(NR,MN) to DIM OI(NR,MN+1) and use MN+1 as the column containing this value.

The next thing we need is a dimension to tell us whether a given item is 'in use' *ie* if it's been placed in a room. This is done by setting up an array that initially holds the reference number of each item:

```
DIM OB(OB):FOR I + 1 TO OB:OB(I) = I:
NEXT
```

Now, if an item is removed from this list we simply put a zero in the appropriate cell.

NEXT WEEK, learn how to place the items in an adventure game and play it to its best advantage.



IN OTHER WORLDS

Adventure game programming is one of the oldest forms of computer fun, as it's of the easiest types of programming and neither a sophisticated machine or even a screen is really needed to play.

On old mainframe computers, you would type in your moves and the computer would respond by printing out its countermoves because most didn't have screens. With the arrival of a language like Basic, which supports commands that allow you to compare strings, adventure programs became even easier and the main concentration moved to the actual content of the game.

The works of J.R.R. Tolkien seem to be the starting point for many adventure games, but the range of topics in adventure gaming is as wide as the range of fiction topics.

A Phillip Marlowe theme, for example, is struck in the Commodore 64 game *The Witness*. You play the role of a detective trying to solve the murder of philanthropist Freeman Linder.

In *The Witness*, you have the ability to question witnesses, examine clues and generally do all the prowling about needed to play detective in a good murder mystery.

Pharaoh's Tomb, an adventure for the ZX Spectrum with an Egyptian theme, combines both on-screen graphics and text to give you a better idea of the environment around you. And the objective, of course, is cold, hard cash — this time in the form of ancient Egyptian treasure.



As you've probably guessed by now, structuring your programs is very important – whether you're trying to structure data or the actual sections of the code.

But as we've explained in a number of other sections over the eight weeks of this series, the primary thing is that you break a program down into the various jobs you want to accomplish. Although you must have a complete and overall view of what you're trying to do with the program, the assigning of specific jobs will eventually have to be taken up.

In the Basic programming language, that task is best represented by the use of the GOSUB instruction, which causes the computer to jump to a certain section of a program, execute that section, and then jump back to the branching point.

In more advanced versions of Basic, it's possible to achieve the same result in a more elegant fashion with the use of FUNCTIONS and PROCEDURES, which can be labelled so you call them in and out of the main program by name.

REPEAT AS NECESSARY

Last week Program Structure looked at a sort routine to operate on a list of data. It concluded with a consideration of what information was needed by the sort.

list must be passed as an address or variable parameter because it is an essential task for the **sort** procedure to physically rearrange some or all of the elements in that list. The actual contents of the memory locations indexed by any named element (eg **list [N]**) can only be altered if their address in memory is known, of course.

By implication, any parameters passed only by value must have that value copied into a newly allocated location, thus being created exactly as if they were declared on entry as variables local to the procedure. By the way, this mechanism is sometimes available in completely unstructured languages, for example BBC Basic.

The sorting algorithm will itself contain a call such as:

swap (list, up, down)

when it is required to swap the upth element of the list with the **downth**. Again, **list** must be passed by address whereas **up** and **down**, the two indexing scanners, are used only as current **values** indicating the elements of the list to be exchanged. The usual temporary storage for the exchange of the two numbers is only used locally, of course.

These methods of defining structures for data, statements and programs are quite sufficient for the specification of most tasks in a procedural

form, but for convenience it can be a good idea to introduce other means of expressing data control (eg type specifications and declarations) and processing requirements.

In particular, multiple selection is better expressed by means of 'switch' or 'case' statements, and when the number of iterations of a loop is known in advance it is more convenient to introduce a **for** statement of the form:

**for count := start to finish
do something interesting**

where count (the loop control variable) is used as either a counter or a scanner to, say, select components of a list.

When an error occurs within this type of iteration construct, especially if 'nested' several layers deep, you've got problems but that's another story. The alternative key word **downto** is used to describe decrementing **for** structures, as in a typical simple sort algorithm.

When an iteration will always be performed at least once, it's possible to add a third repetition construct which does not check the terminating condition until the exit point at the end of the construct. This may be of the form:

**repeat
statement(s)**

until condition

This is not, however, as secure or useful as the **while** or **for** structures which may not be entered at all if the specified looping condition is false. Basic programmers have to live with a **FOR** loop that will execute once, even though the run-time evaluation of the number of times is zero or negative.

In fact, purists frown even on the **repeat ... until** construct, though not with the same vehemence as they regard **GOTO** statements, precisely because it allows the loop to be entered without an exit condition being specified.

A slightly more complete example is afforded by a typical problem involving the reading of some data into a list, sorting it into ascending order and saving the ordered list on a file. A first formulation might be:

```
start
open the raw data file
read file contents into the list
sort the list
write the sorted list onto a new file
close the files
```

stop

Fair enough, perhaps, but there's one obvious problem not stated: how big is the list and will it be filled? Clearly, assuming a reasonably small volume of data, the list will have to be declared to be an arbitrary size bigger than the maximum required for any run.

This in turn will require two further additions to the algorithm. Remember the essential dependency of algorithms on data structure mentioned earlier. First of all an additional data object will be needed to keep track of the current active size of the list (call it **size**). Secondly a check must be

FOR...NEXT loops are a valuable way of getting a computer to repeat a series of tasks a specified number of times. **FOR N=1 TO 20:PRINT "HELLO":NEXT N**, will print the word **HELLO** on screen 20 times.

You can use any number of **FOR...NEXT** loops in a program as long as you don't confuse your variables (ie setting **X** to two different sets of values) or cross your loops (see box at right).

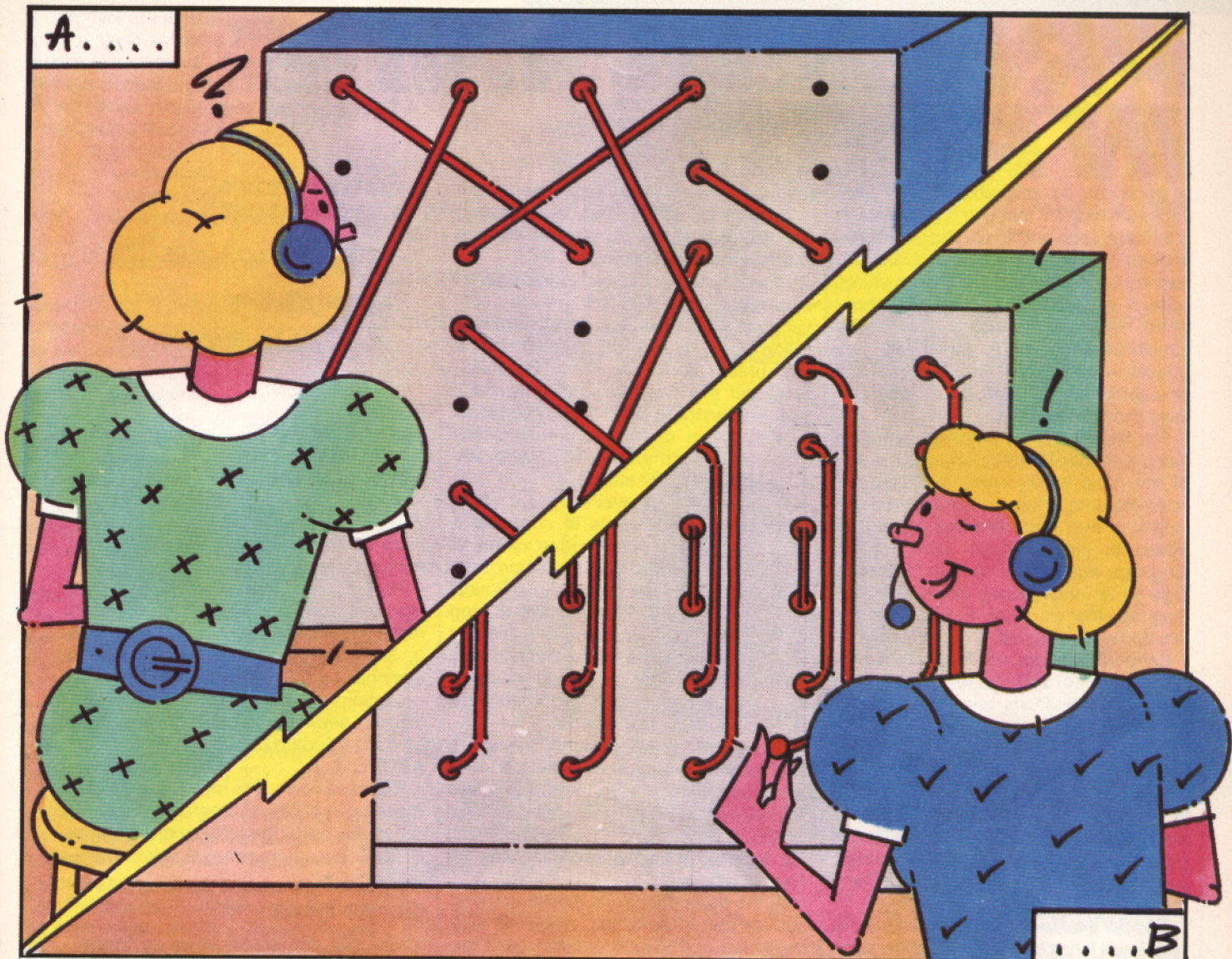
Another way of accomplishing the task of repeating a number of tasks is the use of the **REPEAT...UNTIL** statement, which **REPEATS** an action **UNTIL** a given condition occurs.

This usually takes the form of something like:

```
10 X=0
20 REPEAT PRINT X;
30 X=X+1
40 UNTIL X=30
```

FOR...NEXT

REPEAT...UNTIL



made to ensure that the list never gets full, causing an illegal reference to a non-existent element. Calling the declared maximum index of the list *max*, proceed to formalise the first level of the problem solution in our PDL:

```
start
open (rawfile, newfile)
size := 0
while not (endof (rawfile) or (size=max))
    size := size + 1
    read (rawfile, item)
    list (size) := item
sort (list, size)
save (newfile, list, size)
close (rawfile, newfile)
stop
```

Notice that the **while** construct used to fill the list from the file of raw data has the two possible conditions for termination — the end of file being reached, or the list space fully used. We would be advised to incorporate a check on this before the process subsequent to the loop in case the program were ever used for attempting to process quantities of data beyond its capability. Also the filling of the list has been fully expressed as 'in-line' statements within the **while** structure. This is okay if sufficient thought has been given to the exact processing and data needed, but

should generally be avoided. It would have been better to formalise this as another procedure call thus:

fill (list, rawfile, size)

and to define the procedure **fill** at the next level with the local variable item declared appropriately. The data object *max* will preferably be defined as a constant, but may perhaps also be used as a parameter (value, of course) to the procedure. The heading would be:

Procedure	Fill	(address	list
		address	rawfile
		address	size
		value	maximum)
local item			
	etc . . .		

The raw data file is passed as an address parameter because it is read and therefore its status is altered within the procedure. There may well be restrictions on this idealised formalisation because of memory or language limitations. However they need not concern you directly until the levels of the program have been completely formalised in this manner.

Using this simple but powerful PDL frees us from the constraints of current languages and machines, and anticipates the more powerful ones of the future.

Keeping track of the FOR . . .NEXT loops in your programs is not too different from running an old-style telephone exchange.

Your loops must be "nested" within one another so that you don't "jump out" of the program when you shouldn't. In Panel A, the operator is confusing and crossing wires in much the same way as someone who writes FOR . . .NEXT loops incorrectly:

```
10 FOR X=1 TO 20
20 FOR N=1 TO 59
30 PRINT X,N
40 NEXT X
50 NEXT N
```

FOR . . .NEXT loops should look like the wires in Panel B: "nested" within one another so that the NEXT commands are executed in the proper order:

```
10 FOR X=1 TO 20
20 FOR N=1 TO 59
30 PRINT X,N
40 NEXT N
50 NEXT X
```


PROGRAMMING IN PASCAL

Much can be said about 'better programming': modular techniques, structured code and so on. But languages such as Basic, Fortran and Cobol make life hard for those wanting to write structured code. It is possible for those who really what they are doing to write structured programs using these languages — but the task is both difficult and time-consuming, and structured programming shouldn't be that.

The first high-level language was Fortran (*FORmula TRANslator*), which is one of the most widely used languages in scientific computing. It's been around a long time, and many 'facilities' have been added to the language. Learning the language was difficult enough in its early days so an attempt was made to devise language that was easy to learn, interactive and easy to install.

Basic (*Beginners Aid to Symbolic Instruction Code*) was the result, but it still has many limitations due to its rules of syntax.

Algol (*ALGOrithmic Language*) was the result of an effort to define a language that would be consistent and well suited for those who wished to implement complex algorithms — hence its name. It has gained popularity in educational circles, yet it is hard to learn, difficult to install and therefore unsatisfactory.

Pascal evolved from a search for a high-level language that would be complete, yet easy to learn. It was created by Niklaus Wirth of the ETH Technical Institute of Zurich in 1970-1971 and named after the French mathematician. The language gained acceptance from the educational institutions as a good tool for

learning how to program, and — because it is easy to install — it has also become popular for use on systems that don't have a large amount of memory.

Pascal has been added to and altered by different people, and there are many versions available today. An attempt was made to 'standardise' the language by the ISO (International Standards Organisation), but this has not been universally accepted so there are still many versions. The following discussion refers to the 'original standard' as defined by Wirth and *not* the ISO-defined standard.

Pascal is a high-level language which uses English-like words to construct a program, yet adherence to the syntax of the language must be strict. One misplaced comma or semicolon in a Pascal program can cause the compiler to stop compiling and report an error — and any statements after that error will most likely be treated as errors too, which results in the compiler 'rollerballing' and producing a large amount of error reports.

The language was designed to encourage modular programming, and the steps of an algorithm can be translated into a Pascal module. These modules are called blocks, functions or procedures and must be declared in a specific order within the Pascal program.

All the declarations and definitions must appear in a particular order at the beginning of a Pascal program, and the structure of a Pascal program is shown in diagram 1. Although declarations are optional in Pascal programs you can't do anything worthwhile without them. Here is a Pascal program without any declarations:

```
PROGRAM GREETING;
(* NO DECLARATIONS *)
BEGIN
  WRITELN ('HELLO PCN READERS')
END.
```

A program with declarations would look like this:

```
PROGRAM SUM (INPUT, OUTPUT);
VAR
  A, B : INTEGER;
BEGIN
  WRITELN ('ENTER TWO NUMBERS');
  READ (A, B);
  WRITELN ('THE SUM OF THE TWO
NUMBERS IS ', A+B)
END.
```

Here we have declared two variables of the type integer.

Pascal uses a number of symbols, reserved words and standard identifiers to make up the language (shown in diagrams 2, 3, and 4 respectively). Pascal uses symbols for assignment, mathematical operations and set and type comparisons. You can see in figure 2 that they are made up from standard characters found in the ASCII code.

The reserved words have a pre-defined meaning in a Pascal program. They may not be defined by the programmer (such as *BEGIN*), but others called standard identifiers may be.

Scalar types

There are two scalar types in Pascal; built-in and user-defined. The built-in types integer, real, boolean and char are the most frequently used, although one of the powerful features of Pascal is the ability to define your own data types from the existing ones.



Blaise Pascal is the French mathematician, physicist, religious philosopher and writer after whom the Pascal programming language was named.

By the age of 11, he had — by himself — calculated the first 23 positions of Euclid. At 16, he published a paper on solid geometry.

Perhaps his most significant contribution to the world of computing is the Pascaline calculating device he developed to help his father in the calculation of tax.

Integers are whole numbers. On many micro implementations of Pascal, integers are in the range of -32767 to 32768. A number of operators are available to each of the standard data types and the integer type has the following:

+	addition
-	subtraction
*	multiplication
DIV	division which yields a truncated result
MOD	modulus yields the remainder of a division

Besides the operators, Pascal offers relational operators which are common to all the standard types, or types defined by the programmer:

>	greater than
>=	greater than or equal to
<	less than
=	equal to
<>	not equal to

The result of using these relational operators is a boolean value that is either true or false.

In Pascal, real numbers correspond to usual floating point (decimal) numbers. The minimum and maximum magnitude of the real depends on the particular implementation of Pascal, and this can vary between different compilers. Real numbers can be represented in decimal notation, but there's provision for real numbers to be represented in exponential notation, such as 1.0E7 which is $1 \times 10^7 = 10000000$.

The type 'char' can consist of any character that is available on the computer installation. These are represented in Pascal between single quotes, 'F', '!', etc. Comparisons can be made with "char" and the binary value that is used to represent the character. No arithmetic operators are available for char, yet it does have a number of operators and functions:

ORD(C) Ordinal function which yields the ordinal value of the character.

CHR(I) Character function which yields the character whose ordinal number is I.

PRED(C) Predecessor function which yields the previous character in the representation used.

SUCC(C) Successor function which yields the next character in the representation.

Last in the pre-defined scalar type is boolean, which many Basic programmers argue is not a data type (but it is). Boolean is a logical type and may have one of two values, 'true' or 'false'. These results are usually obtained through comparisons. It has the operators AND, OR and NOT.

You have seen how to assign standard types in the second example Pascal program, and as with other languages, we can have more than one data type:

```
VAR
  A,B,C : INTEGER;
  F,R : REAL;
  P : CHAR;
  T : BOOLEAN;
```

Next week: more on Pascal.

figure 1

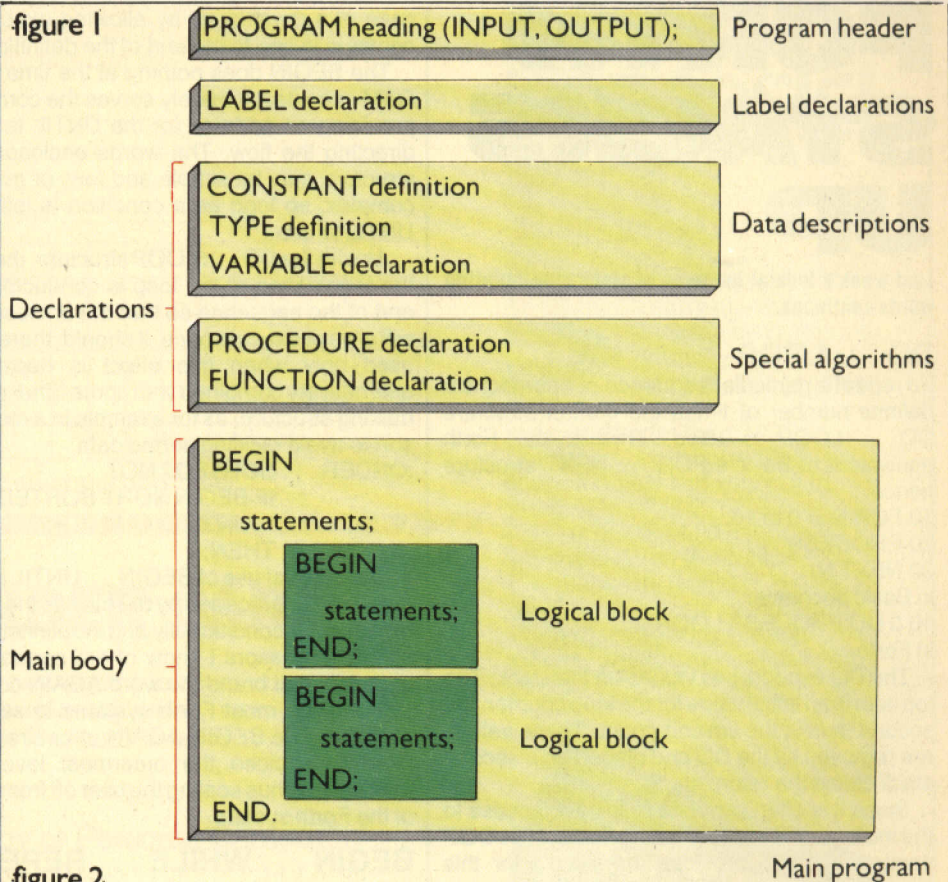


figure 2

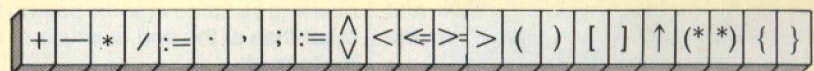


figure 3

AND ARRAY BEGIN CASE CONST DIV DO DOWNT
ELSE END FILE FOR FUNCTION GOTO IF IN LABEL
MOD NIL NOT OR OF PACKED PROCEDURE
PROGRAM RECORD REPEAT SET THEN TO TYPE
UNTIL VAR WHILE WITH

figure 4

FILES: INPUT OUTPUT
CONSTANTS: FALSE TRUE MAXINT
TYPES: BOOLEAN CHAR INTEGER REAL ALPHA
FUNCTIONS: ABS ARCTAN CHR COS EOR EOLN
EXP
IN ODD SIN SQR SQRT SUCC TRUNC
PROCEDURES: GET NEW PACK PAGE PUT READ
READLN RESET REWRITE UNPACK
WRITE WRITELN

Note: For the sake of brevity, not all the reserved words or identifiers have been included.

FORTH STACKS UP

Last week's look at the uses of stack manipulation words continues.

DO . . . LOOP

To repeat a particular sequence of operations a definite number of times the control structure DO . . . LOOP is used. This is the Forth equivalent of Basic's FOR . . . NEXT structure hence:

```
10 FOR N = 0 to 10
20 PROCESS
30 NEXT N
in Basic becomes:
10 0 DO PROCESS LOOP
in Forth.
```

The DO expects two values on the stack. The top item is an initial value for the loop counter, the second item is the limiting count. These values are removed by the DO and placed on a second stack called the return stack.

Since it is often convenient to have access to the index during the operation of a DO . . . LOOP sequence, Forth provides the word I for this purpose. The action of I is to copy the value on top of the return stack onto the parameter stack, and thus when used in a DO . . . LOOP will return the current value of the loop index.

```
:SAMPLES (n . . .) 0 DO I SAMPLE LOOP;
```

In this example the index values might be used by SAMPLE to search an area of memory, or as data to be processed. One thing to remember is that since the test against the limit is done at the end, the loop sequence will always execute at least once. So executing:

```
0 SAMPLES
will still process one sample. To prevent this an adjustment can be made to the definition of SAMPLES, with the inclusion of an IF . . . THEN;
:SAMPLES (n) ?DUP IF 0 DO I SAMPLE LOOP THEN;
```

The ?DUP duplicates the top item of the stack only if it is non-zero. If the value is zero it is not duplicated but is removed by the IF whereupon execution continues after the THEN. A non-zero value would be duplicated so that it is available for the DO . . . LOOP.

BEGIN . . . UNTIL

Most computer applications require, at some time, a particular set of actions to take place and to be repeated until some condition has been fulfilled. When a language provides such a structure it makes life easier. Forth provides just such a structure, its general format being:

```
:PROGRAM BEGIN ACTIONS DONE UNTIL;
ACTIONS perform all the actions required by the program and DONE performs some kind of test and, on the basis of the result, leaves either a true flag or false flag on the stack. UNTIL responds to the condition on the stack by either rerouting execution back to the BEGIN, in the
```

case of a 0 value, or by allowing execution to continue in-line to the end of the definition.

The BEGIN does nothing at the time PROGRAM executes, it merely serves the compiler by providing an address for the UNTIL to use for directing the flow. The words enclosed in the structure may be simple and few, or many and complex, so long as a condition is left for the UNTIL to use.

As with the DO . . . LOOP structure, the test for the termination of the loop is conducted at the end of the sequence so that the enclosed code will always execute once. It should, therefore, be used only when this effect is desirable or alternatively combined with some other decision making structure, as for example in a multi-pass, sort to avoid tackling sorted data:

```
:ORDER . . . SORTED? NOT
IF BEGIN SORT SORTED?
UNTIL
THEN;
```

One special use of BEGIN . . . UNTIL is where the UNTIL is preceded by 0. This has the effect of repeating unconditionally and indefinitely. Since all the processors I know of are capable of an unconditional branch the word AGAIN comes as standard on most Forth systems to serve this purpose. The BEGIN AGAIN structure is often used to enclose the outermost level of an application, thus sealing the user off from the rest of the Forth system.

BEGIN . . . WHILE . . . REPEAT

In instances where a decision to stop looping needs to be made at some point in the sequence other than at the end, a structure is provided in the form of:

```
:PROGRAM BEGIN ACTIONS ENOUGH NOT
WHILE MORE
REPEAT;
```

Here the ACTIONS are always performed at least once, whilst MORE need not be.

The portion of code between the WHILE and REPEAT statement is only executed if the WHILE finds a true condition on the stack. In that case execution continues down to the REPEAT and then branches back to the BEGIN. If the WHILE encounters a false condition, then execution is directed to re-commence after the REPEAT and the loop is terminated.

Note the difference in the logic of UNTIL and WHILE. UNTIL terminates the loop when it finds a true value on the stack whereas WHILE terminates with a false value.



The arcade game machine you see above is probably either running the Forth computer language or its own machine code.

Forth is often used for developing arcade games, controlling robots and running arcade games on dedicated machines.

Its great advantage is speed, and it's that speed that makes it more appropriate for driving a speeding pacman or lifting an on-screen plane to the sky.

Contributors: David Janda, Dick Olney, Niklos Shawl and Bryan Skinner

Design: Nigel Wingrove

Micropaedia Editor: Geof Wheelwright

Illustrations: Virginia Armstrong and John Hallet

NEXT WEEK

We conclude our programming series with a last look at the high-level Pascal programming language, complete our introduction to adventure programming, glance back at program structure and take a quick peak at the CP/M business operating system.

And in two weeks time, we give you a special one-part Micropaedia special all about computer monitors, including: how to buy them, what to look for and how they work.



FIRING LINE

VIC 20

Saving energy

Name Creepers **System** Vic 20 **Price** £5.95 **Publisher** Virgin Games, 61/63 Portobello Rd., London, W11
Format Cassette **Language** Basic
Other versions None **Outlets** Retailers

Creepers is the first game from the Virgin stable I've played but it's yet another variation on the 'shoot them down' principle.

Objectives

The objective is simple: protect your own interests *ie* stay alive. The aliens are dropping down to pinch you energy blocks, and you have to zap them if you can, before your energy runs out, and before they zap you.

In play

To play the game is really just a question of finding the right spot to rest your fighter, and to keep pressing the fire button. The game features both joystick and keyboard controls, so you can choose. The choice of the particular keys is strange, and not one that I've seen before: up—U, down—Spacebar, left—H, right—K, and fire—RUN/STOP. A little bit awkward, and for a change I preferred the joystick.

You appear on the left-hand side of the screen, in your fighter, and can point left or right and up or down. A cluster of inverted 'A's is hanging from the top of the screen to your

right (A for Alien I suppose). Also on your right, but at the bottom are your energy blocks. These are what the 'A's drop off and pick up every so often.

If you keep firing, you seem to get most of them, but as there's little variety on this pattern of events there doesn't seem a great deal of incentive to keep on playing.

What variety there is, is restricted to 'watchers' which appear every so often and bob up and down. This is described as taunting on the cover, but in fact can be avoided by staying put and firing away. There are also some movements going on behind you, which is why you can face backwards too. This movement doesn't seem especially harmful, though.

The programmer writes, on the leaflet that comes with the program, that he would like to have a go at programming adventure games, and maybe this would give him a better opportunity than Creepers has to display his talents.

Verdict

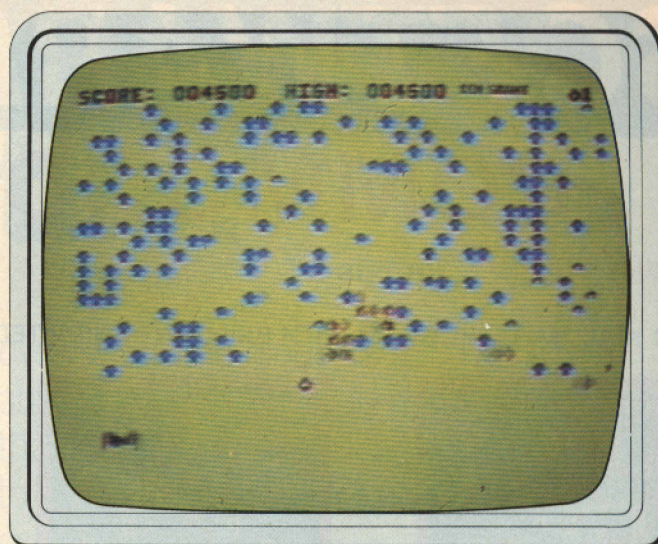
I'm not very impressed with this at all. The game seems to lack any motivation, and the absence of variety will probably send you to other pastures fairly quickly. The game is also spoilt by the way you can do nothing but fire away, moving about very occasionally and still seeming to get quite respectable scores. It's not that it's too easy, it's just far too dull. **Piers Letcher**

Lasting appeal

Playability

Use of machine

Overall value



COMMODORE 64

Spray and pray

Name Exterminator **System** Commodore 64 **Price** £5.99
Publisher Bubble Bus, 87 High Street, Tonbridge, Kent TN9 1RX
Format Cassette **Language** Machine code **Other versions** None **Outlet** Mail order

It doesn't matter whether it's summer or winter, those centipedes continue to infest our computers, wriggling their way down countless TV screens. Bubble Bus has brought out a new version: Exterminator is one of the best I've seen, and includes the most realistic spider ever to make you leap for the nearest dustpan.

Objectives

The aim is simple — if it moves, shoot it; if it doesn't, shoot it anyway, for in this game the laws of nature and logic are suspended.

A new species, a worm with legs, steadily threads its way down through mushroom-like blue cacti. Armed with a spraygun, you puff away at the cacti and worm, scoring points for every hit. When a segment of worm is struck, it turns into a cactus, the rest of it continuing, unperturbed, on its own sweet way.

From time to time, you must defend yourself against a low-swooping eagle, a mosquito diving straight down the screen, and a scorpion. All can be exterminated. A hairy, life-like tarantula crawls across the bottom of the screen — all you can do is keep out of its way and

hope that it will go away.

In play

The black worm and blue cacti appear on a cheerful yellow background. Your spray gun, which is a repeating fire model, is represented by a nozzle confined to the lower portion of the screen. As the worm is hit, it breaks up and before long umpteen little segments are trampling all over the place. To the sound of a harsh honking, a purple eagle appears hovering just about you and swooping. If it makes contact, you lose one of your three nozzles.

A loud hum warns of the imminent descent of a plummeting green mosquito — dodge it or shoot it. Similarly, a white scorpion scampers across high up — bonus points for potting it.

Extra lives are awarded for high scores and the game gets faster as you progress, with the screen changing colour at each new stage. Scores and statistics are printed at the top of the screen, being updated like those electronic train-departure boards. The sound effects are nicely done but if you prefer a quieter game, they can be turned off, and the action can be frozen with the F7 key.

Verdict

Exterminator has superb animated graphics (the spider and worm are great), is full of action and uses sound effectively. For quality in all departments, this takes the prize. **Bob Chappell**

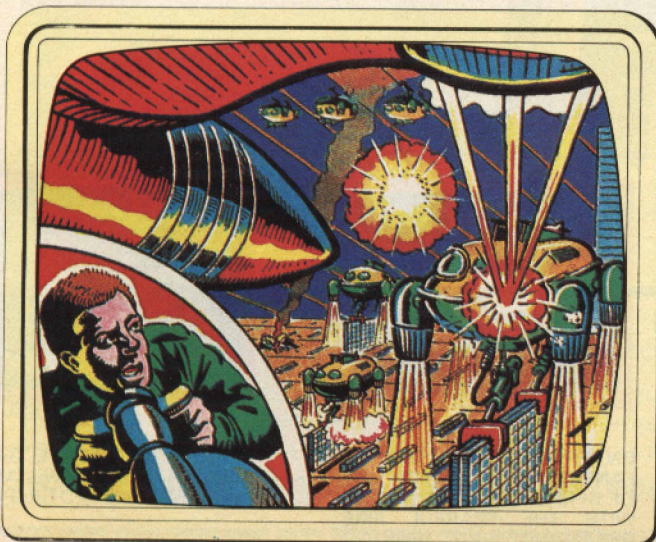
RATING

Lasting appeal

Playability

Use of machine

Overall value



John Lettice takes his Spectrum from the Spanish Main to the familiar monster mazes.

Spectrum special

The Spectrum has now passed its first anniversary, and the current batch of games being released shows that age cannot wither it nor custom stale its infinite variety—in some cases at least.

PLUNDER

First off the slipway is an everyday story of seafaring folk. In *Plunder*, your objective is to stop the Spanish Armada sailing by pillaging the convoys of gold Spain is shipping to finance it.

You sail your ship—a nice little user-defined graphic—around a very impressive high-resolution map of the Atlantic Ocean, seeking out galleons (can be nasty), troopships (you can deal with these, but boarding might not be such a smart idea), merchant vessels (sitting ducks) and finally the warships (run for your life).

While you're doing this, the sea takes its toll of crew and hull, and naturally the odd cannonball can make mischief. So you use some of your winnings—they're probably tainted with the curse of Montezuma anyway—to hire new crew, make repairs, and perhaps do a little trading and/or drug running.

Yes, that's right, you can buy one of Central America's less savoury products in Haiti and sell it at a profit at Marseilles. I didn't run into Gene Hackman, but he and other cops might still prefer it if you stuck to grain and diamonds.

One nice point about *Plunder* is that it's actually fairly realistic. Broadly speaking, you can take on the ships a thieving buccaneer/national hero of the time would be able to, with approximately the logical consequences (although merchant seamen seem to be a lot less ready to run up the white flag than I'd expect). And I won't swear to it, but the warships really do seem to follow you around, hunt the *Graf Spee* style.

All in all, it's a particularly neat and inventive execution of what is becoming a fairly common idea.

BARON



Baron is another offering in the honourable tradition of Candyfloss. Here your goal is to manage a small fiefdom, fighting off the villains and beating up the villeins.

You can play it solo, but the game is really geared to several—up to four—players. All players start off with the same amount of land, peasants and cash, and your goal is to manage these resources. You can play the game the peaceful way, tending your crops and amassing land legitimately by purchase, or you can hire mercenaries and pillage your neighbours.

It's certainly refreshing to see a computer game that'll take more than one player, but there are problems with this one. The instructions are a little rosey—for example, you can increase your supply of peasants by feeding more than you've got, but you aren't told this. There was one annoying bug on the review copy. At one point the program asked if you wanted to hire mercenaries. You answer 'y' or 'n'. . . and then it asks you if you want to hire mercenaries, up to a dozen times.

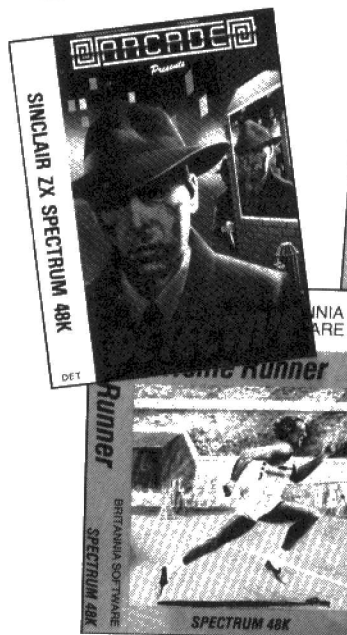
It defies belief that a manufacturer could send out a game with a louse-up like this in it, but there it is. If it wasn't for this boredom-inducing bug, the game would be relatively entertaining for several players. The one-player version is a fairly pointless exercise.

ESCAPE



I could forgive this one a lot. It's a new twist on maze games, where you're stuck in a Hampton Court style environment, being pursued by various prehistoric monsters. Your aim is to find an axe, then use it to break down a door and get out of the maze.

But the real killer is the way the dinosaur comes after you, using the Spectrum's excessively quiet speaker to produce a 'pad pad pad' noise as it runs. I



never did get out of the maze, but I plead that I was too busy laughing at the dinosaur. If you can control yourself, it has potential to be a fast and entertaining maze game.

THE DETECTIVE



More humour here. Load up the Detective and you're presented with a natty title page, across which you see a row of bullet holes creep. Start on the game and you see a small figure in the centre of the screen; cursor left or right and the figure saunters, slowly but purposefully, in the relevant direction.

If you press the fire button the figure stops, whips out two guns and blazes away at the sky, the reason for this being that there are things falling out of the sky at you.

Yes, you've guessed it, someone's thought of yet another twist on Space Invaders. According to the instructions, you've got to get through Dagger Alley (all 25 screens of it), then crack a safe. The mob's 'out to get ya' (according to this 'broad' you met), and they're trying it in all sorts of weird ways.

The first screen seems to have them dropping giant-sized ring-pulls on you, while in the second they seem to be lamp-



shades. In addition to this, rows of car tyres form up above your head and then fall on you, and if the dog comes by you lose all your points.

It's not particularly fast to start with, but it's tricky, and highly entertaining.

HOME RUNNER



Put together an Olympic runner, a set of monsters and some scaffolding, and *Home Runner* is what you come up with. You hop, skip and jump your way up a number of levels, avoiding monsters and the holes that appear in the floor every now and then, until you get to home, at the top level.

I didn't find the monsters made my pulse race.

Plunder (£6), Cases Computer Simulations, 14 Langton Way, London SE3 7TL
Baron (£5.95), Temptation Software, 58-59 Poland St, London W1
Escape (£4.95), New Generation Software, Freeport, (BS 3433), Oldland Common, Bristol
The Detective (£5.50), Arcade Software, Technology House, 32 Chislehurst Rd, Orpington, Kent BR6 0DG
Home Runner (£4.95), Britannia Software, 116 Woodville Rd, Cardiff CF2 4EE



CRYPTIC CLUES

DRAGON 32

Arcade vs. adventure

Name Death Mines of Sirius **System** Dragon 32, 1 joystick **Price** £9.99
Publisher Phoenix Software,
 Spangles House, 116 Marsh Road,
 Pinner, Middlesex **Format** Cassette
Language Machine code **Other**
Versions None **Outlets** Mail order/
 retail.

Trying to combine arcade and adventure games is nothing new, though what Phoenix have done is provide two tapes labelled The Action and The Adventure, with success at the first bringing you a code that enables you to play the second.

Objectives

The arcade section is a version of that aged favourite, Lunar Lander, in which you are rescuing men from the planet surface, while the adventure requires you to save your damaged ship from a fungus growth that is slowly moving towards it.

First impressions

The tapes come in a colourful wallet and are well-documented, mentioning that you will need a joystick. I have to admit to a stifled yawn when I discovered the arcade action was merely Lunar Lander.

In play

I yawned too soon, however, as this proved to be one of the best versions I've seen, with an impressive opening of explo-

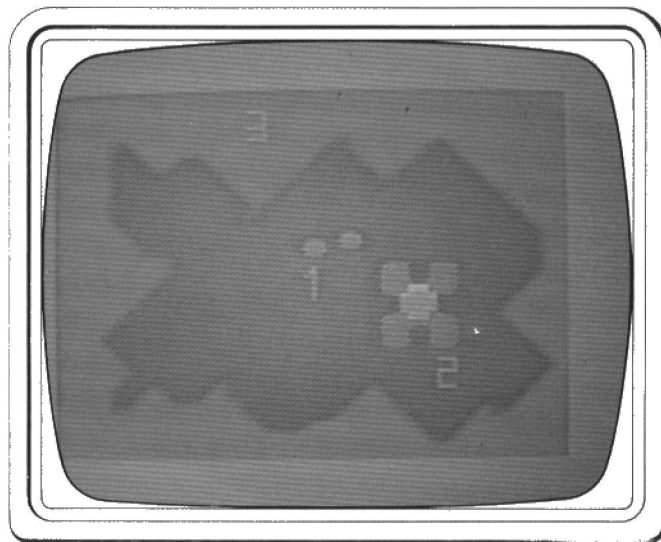
sive graphics, the theme from 2001, and the story outlined by a robotic voice via the TV loudspeaker. There are optional instructions and then you're on the first of the 12 skill levels, with four ships and 9999 units of fuel to rescue as many trapped men as possible and uncover clues to that adventure code.

There are 41 men split between the four landing pads, though you needn't return to the mother ship between each landing. You can hop from pad to pad and deposit them all at the end if you wish, and if you can manage it. The fire button activates your retro rockets in the direction of your joystick, and, as you might expect, all the controls have a slight delay mechanism built-in.

If this sounds fairly straightforward, there is a complication in the shape of asteroids floating across the screen which transform the game from the merely tricky to the downright difficult. The rocket responded well to the controls, though the asteroids failed to respond to yells of 'Get out of the way. . .'

Across the top of the screen are four pieces of information: the number of men saved so far, the number you're carrying at the moment, the fuel remaining and the lives left. The only easy part of the game is docking with the mother ship, where you merely float across underneath and the men are transferred automatically.

Success at each screen brings you some Morse-like bleeps and a message such as 'Don't count your Drunics.' Collect the cryptic comments and you should be able to piece together a running code for the adven-



ture, which could take some considerable time as the screens naturally get harder as you go.

What a pity, then, that when you get there the adventure is something of a disappointment. It is divided into two parts, one on each side of the tape, and yet another running code must be discovered from part one to enable you to play part two. This could go on forever.

The first drawback is that you have to load the adventure completely before being asked to input what you think the running code is, and if you get it wrong or hit the wrong key the program crashes and you must reload.

I assume this is designed to prevent guessing, but it seems rather harsh when it would have been easy to have just the first few program lines load and then refuse to proceed till the right code was received. Guessing is impossible anyway, as you don't know if the code is a word, a phrase, a sequence of numbers or letters or what.

But when all this rigmarole is sorted and the adventure is running, you'll find your damaged ship is down on the surface of Sirius. You're told how long it will take to repair, which is about four times as long as it will take the deadly fungus growth to reach you and kill you off. There are four courses of action open to you, and you're given their respective chances of success: go out and find an antidote and you stand a reasonable chance of success, hope the fungus dies which is not very likely, attempt to control the fungus which is virtually impossible, or sit back and do nothing *ie* commit suicide.

The first is the option to take as the others merely result in quick deaths. The main prob-

lem with the adventure, which is mostly text with a few graphics, is that wherever you're given a choice of actions the wrong option will simply kill you off and return you to the start.

So you retrace your steps, make the other choice, are confronted by yet another choice, and if you get that wrong you're back to the start to retrace your steps yet again, and so on. In other words it's not so much an adventure as a series of guesses . . . till you get to the point where you have to deduce another code.

The whole thing is more like a classroom examination than a genuine adventure. Once you do know all the right answers there is no point in ever playing the game again.

The poor impression the adventure gives is not helped by a succession of spelling mistakes which should never find their way into a supposedly professional program: there chance instead of their chance, opennings for openings, unconscious for unconscious, and so on.

Verdict

If the action game were sold on its own at half the price The Mines of Sirius would get a good recommendation, but it's hard to see who the two games together would satisfy. Anyone interested in a good adventure will be disappointed, while arcade fans will only be keen on the action tape anyway.

Mike Gerrard

RATING

Lasting appeal:



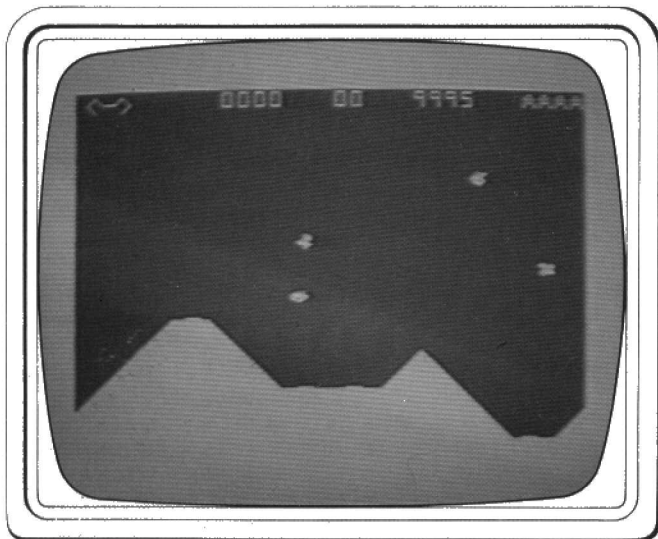
Playability:



Use of machine:



Overall value:



PCN ProgramCards

Two games for program cards this week. One for the BBC model B and one for the Spectrum 16K. The games differ a great deal, the Spectrum one is a puzzle that needs a bit of thought to solve, the BBC one is a zoom around the screen and shoot it up game.

Pyramid comes from Mr. S A Wring of Clevedon in Bristol. You pit your wits against the computer, trying to solve the puzzle it sets you. The puzzle involves a pyramid of random numbers. The computer chooses a route down the pyramid, which it keeps to itself (of course). The idea of the game is to find a route from the top of the pyramid to the bottom, while obtaining the same total as the computer.

The only clues you are given to find the route, or it's equivalent, are the sum of the numbers passed through, and highlighted squares on the computer's route. The number of highlighted squares depends on the difficulty selected. Lastly, note that

line 9000 is included to allow the screen colours to be set to normal if *break* is used to get out of the program. To use type 'GO TO 9000'.

The BBC program from A D Poole of Maidenhead, Berkshire, is a game called Falklands Raid. The program consists of a two dimensional section across the Falklands Islands, which is split up into five screen size sections; you are not bound to stay within these five sections, although your fuel is limited (500 units at the start and after each refuelling). When outside the specified five sections, there is a random chance of finding an aircraft carrier to refuel from.

The aim of the game is to fly over the islands firing on the enemy bases, ships, fuel dumps and radar antennas. Note that it is safer to fly low, otherwise you will come under enemy anti-aircraft fire. If you are hit, or you fly into something, besides the land, you damage the aircraft. Any more

hits and you'll not make it home. You are allowed to fire up to five air to ground (or sea) missiles at any one time.

All of the ships, planes, and installations are user defined characters and are defined using the loader program. Also in the loader program are various system variables which, if changed, will allow you to alter the characteristics of the game. Try making J% larger and see what happens to your maximum velocity!

If you have any programs, games or utilities sitting on the shelf at home, or that you have just written, why not send them in to ProgramCards? The more interesting, clever, well programmed and original, the more we pay for the program. Send your program on either a cassette or disk, preferably with a listing, instructions and comments, to:

Programs Editor, Personal Computer News, Evelyn House, 62 Oxford Street, London W1A 2HG.

PCN ProgramCards

Falklands Raid Card 1 of 2 (Loader)

8336FR1/2

>L.

OMDDE1:W%=0:V%=1:@%=0:K%=0:J%=22:L%=

0

10*K.OMD.7:MVDU14:ML:IM

20VDU23,240,16,16,16,56,40,254,248,56
23,243,0,0,0,32,32,44,40,56,23,244,3,11
15,47,127,63,31,31,23,245,208,224,240,2
44,254,252,248,248,23,252,24,40,72,146,2
54,42,85,255,23,253,82,255,255,255,255,2
55,255,255,23,241,0,74,16,92,58,8,82,0

30VDU23,238,128,0,0,0,0,0,0,0,23,239,
0,0,24,36,231,24,0,0

40VDU23,250,92,92,92,82,255,255,255,2
55,23,249,8,8,8,28,8,127,62,28,23,246,54
62,124,255,123,62,31,15,23,247,0,0,0,25
5,187,238,255,255,23,248,0,0,1,247,178,2
36,248,240,23,242,32,32,96,36,36,36,46,1
00

50*K.10DIMA 500:MCALL!-4:IM

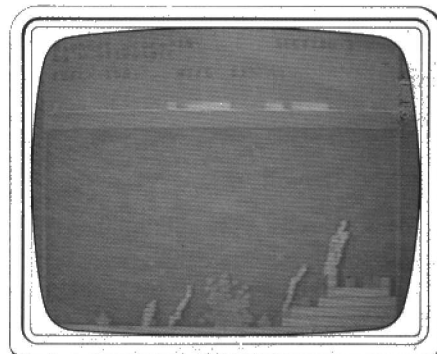
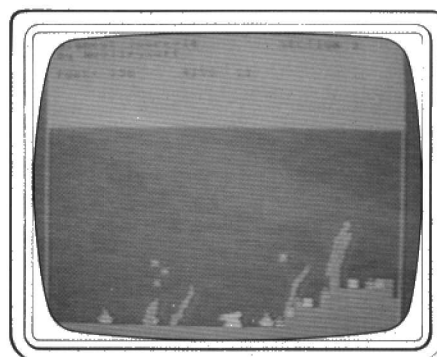
0 Select screen mode and initialise variables, note that some of these variables are carried over into the main program

10 Set key 0 for editing

20 Use the VDU 23 command to define characters for the ships etc. Character 243 is the top of a battle ship. Character 244 is the left half of a battleship, with char 245 being the right half. The radar is defined by character number 252. The ground and fuel dumps are defined by character 253. The exploding missiles are done with character 241.

BBC B BBC Basic

Application: Game
Author: A D Poole



PCNProgramCards

Falklands Raid Card 2 of 2 (Loader)

8336FR2/2

```
60COLOUR2:ONERRORRUN
70PRINTTAB(8,0)"Falklands Bombing Raid"
75COLOUR1
80PRINTTAB(0,3)" You are an R.A.F Harrier pilot flying from H.M.S Hermes (shown by a'1'on your flying map). Although this is your base ship there are also two other carriers that are in your range, allowing you to refuel.(shown by 2)"
90PRINT" Your orders are to fly over east ";
91PRINT" and west Falkland whilst firing missiles ";
92PRINT"at the enemy ships, radars and bases, ";
93PRINT" situated on and around the islands. You can fly as far east and west as you wish, but you do have limited fuel."
```

```
99COLOUR3
100PRINTTAB(0,15)"KEY'S TO USE
ENEMY"TAB(0,17)"A'.....For up
";CHR$(252);" radar"TAB(0,19)"Z'.....
For down"TAB(0,19)"Z'.....For right
";CHR$(249);" small ship"
110PRINTTAB(0,20)".....For left"TAB(0,21)"TAB'...To fire ";CHR$(244);CHR$(245);" Large ship"TAB(0,22)"D'..To detenate"TAB(24,23);CHR$(253);" stores dump"
120PRINTTAB(0,21)"TAB'...To fire ";CHR$(244);CHR$(245);" Large ship"TAB(20,25);CHR$(246);CHR$(247);CHR$(248);" AIRCRAFT CARRIER"TAB(20,24);CHR$(242)
130VDU28,5,30,30,27,31,3,2
135A=GET
140COLOUR 2:CHAIN"FALKL"
```

30 238 is the character for a missile, note that this may be too small to see on a television and may need redefining. Character 239 is the harrier. Cruisers are defined with 249 and the aircraft carriers are defined with characters 246 to 242.

50 Define Key 10 to beep on reset.

60 Set printing colour and define error trapping routine.

70 Title.

75-120 Print in red, the instructions.

130 Set up a loading window.

135 Press any key to continue.

140 Chain the main program. Note that the program name can be anything you like, as long as the main program is saved under this name.

PCNProgramCards

Falklands Raid Card 1 of 5 (Main)

8336FM1/5

```
10MODE1:COLOUR131:CLS
20C=0:T=1:H$="Woolleysoft":HIZ=10:DIM
C$(10),CC$(10),XS$(5),YS$(5),MSX$(5),MSY
$(5),IX$(5),LX$(5),MLX$(5),MEZ$(10),MRZ$(10)
30FOR @%=1 TO 5:LX(@%)=0:MLX(@%)=0:NE
XT
40@%=0:TZ=0:WT%=1:A=1:B=0:DD%=0:DZ=0
50COLOUR0:VDU4:PRINTTAB(1,1)"Highest
score=";HI%TAB(1,2)"by ";H$;" "TAB(1,4)
)"FUEL=";TAB(15,4)"HITS=";VDU5:PROCBACK
60VDU24,10;40;1270;700;
70X%=100:Y%=120:MX%=10:MY%=0:FU%=500:
HX%=0:Z%=1:E%=1:NZ=RND(10)-5:PROCLAND
80PROCCC:GOTO80
90DEFFROCF:IFZ%=RND(3)+1ANDY%+8*MY%>2
00THEN100ELSE150
100TZ=TZ+1:WT%=WT%+1
```

BBC B BBC Basic

Application: Game
Author: A D Poole

```
110IFTZ>5TZ=0
120SOUND0,-12,60,1:MEZ(TZ)=X%+8*MX%+RN
D(100)-50:MRZ(TZ)=Y%+8*MY%+RND(100)-50:G
COLO,2:MOVEMEZ(TZ),MRZ(TZ)+20:VDU241
130IFWTZ>5WTZ=0
140MOVEMEZ(WTZ),MRZ(WTZ)+20:GOCOLO,0:VD
U241
150ENDPROC
160DEFFPROCCC
170PROCF
180*FX15,1
190IF POINT(X%,Y%-20)=3THENPROCLANDED
200IF FU%>0THENPROCLIV
210IF@%=5THEN@%=0
220@%=@%+1:IF LX(@%)=0ANDMLX(@%)=0THEN
250
```

10 Select mode and colour.

20-40 Set up variables and dimension arrays.

50 Print Hi-score and the top of the screen titles, then draw the background.

60 Define graphics window.

70 Set up some more variables then draw the ships.

80 PROCCC is the game so keep repeating it.

90-150 This procedure checks to see if you are above a certain height and if so, puts flak into the air.

160 This is the main program procedure.

170 Do flak routine.

180 Clear buffer.

190 Check whether harrier has landed, and if so, do PROCLAND.

200 Check fuel and execute PROCLIV if fuel greater than zero.

210 Check @%.

220 Check for flames, if none then 250.

8336MM10/11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	5
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[illegible]

9030-9032	Data for playing 'Yesterday'
9040-9042	Data for playing 'Sound of Silence'
9050-9052	Data for playing the 'Entertainer'

9060-9062	Data for playing the 'Funeral March'.
9100-9110	User defined graphics for the fool on the hill.
9120	Extra user defined graphics for the teacher.

PCN Program Cards

Mini Math

Card 11 of 11

8336MM11/11

[illegible]

```

9750 DATA "NPO","BUC"," H ","JOIK
9751 DATA "DPO"," UO"," H ","JOIK
9752 DATA "DPE"," U "," H ","JOIK
9753 DATA "DPE"," U ","NNO","G F
9754 DATA "NPO","BUC"," H ","JOIK
9755 DATA " S "," " " R "," " O
9756 DATA " S "," " " "NNO","T F
9757 DATA " P "," " " R "," " O
9758 DATA " S "," " " "NNO","TO
9800 LET x=0: LET arragaaa=1: L
ET FOR i=0: LET sc=0: LET count=0
: LET tsc=0: LET tcount=0
9810 FOR a=1 TO 10: LET r#(a)=y#
(a): LET s(a)=u(a): LET l(a)=v(a
): NEXT a: GO TO 9900
9995 IF VAL a#<1000 THEN LET t=1
9997 RETURN

```

9501-9508	Data for movement of the fool on the hill.
9600	Data for music of 'Fool on the Hill'

9700	Data for 'Congratulations'.
9750-9758	Data for movement of teacher.
9800	Reset variables.
9810	Reset arrays.

ZX Spectrum
Spectrum BasicAuthor: S A Wring
Application: Game

```

10 GO SUB 2222
90 BORDER 0: INK 0: PAPER 2: C
15
122 REM HORIZONTAL PYRAMID LINE
135 LET B=200
110 LET C=101
115 PLOT 200,55: DRAW -101,0
120 FOR A=64 TO 162 STEP 2
130 PLOT B,A
140 DRAW -C,0
150 LET B=B-8
160 LET C=C-16
170 NEXT A
200 REM VERTICAL PYRAMID LINES-
205 LET B=56
210 LET A=127
215 LET C=96
220 PLOT 127,55: DRAW 0,56
230 FOR D=0 TO 96 STEP 8
240 PLOT A+D,B
250 DRAW 0,C
260 PLOT A-D,B
270 DRAW 0,C
280 LET C=C-8
290 NEXT D

```

```

300 REM NUMBER SETTING AND PRINTING
310 RANDOMIZE 0: REM 728 561
315 LET D=14
320 LET N=2
330 DIM X(12,24)
340 FOR A=1 TO 12
350 FOR B=1 TO N
360 LET X(A,B)=INT (RAND*9)+.5)
370 PRINT OVER 1: PAPER 7: INK
1: AT A+2,D+8: X(A,B)
380 NEXT B
390 LET D=D-1
395 LET N=N+2
399 NEXT A
400 REM SETTING THE COMPUTER'S
NUMBER ROUTE & TOTAL-----
410 LET B=1: IF RAND*16 THEN LET
B=2
415 LET I=8
420 DIM H(12): DIM U(12)
430 LET TOTAL=X(1,B)
440 LET U(1)=3: LET H(1)=B+14
450 FOR A=2 TO 12: LET U(A)=A+2
460 LET Z=INT (RAND*9)+.5)
470 IF Z=3 THEN LET Z=-1: GO T
O 500

```

10 Gosub and print title pages.
90 Set border and paper for game.
100-170 Draw horizontal pyramid lines.
200-290 Draw vertical pyramid lines.

310 Set up random number seed.
315-395 Put random numbers into the pyramid.
400-530 Select computer's route and total.

```

480 IF Z=6 THEN LET Z=3: GO TO
500
490 LET Z=1
500 LET B=B+Z+1
510 LET TOTAL=TOTAL+X(A,B)
520 LET H(A)=15-A+B
530 NEXT A
550 REM GO SUB FOR PLAYERS GUESS
: GUESS-----
560 GO SUB 1500
600 REM PLAYER'S GUESS & ROUTE
SAVING-----
610 LET B=1
615 DIM D(12): DIM E(12)
620 GO SUB 3000
630 LET GUESS=X(1,B)
640 LET E(1)=3: LET D(1)=B+14
645 PRINT OVER 1: PAPER 5: AT E(
1),D(1): " "
650 FOR A=2 TO 12
655 BEEP .5,40
660 PRINT PAPER 0: INK 0: AT 10,
20: GUESS
670 LET E(A)=A+2
675 REM MOVING CURSOR ROUTINE--
680 IF INKEY$="" THEN GO TO 690
690 IF INKEY$=CHR$ 53 THEN LET
Z=-1: GO TO 750
700 IF INKEY$=CHR$ 54 THEN LET
Z=0: GO TO 750

```

```

710 IF INKEY$=CHR$ 56 THEN LET
Z=1: GO TO 750
720 IF INKEY$=CHR$ 62 OR INKEY$
=CHR$ 114 THEN GO SUB 1000: GO T
O 1500: GO TO 680
730 IF INKEY$=CHR$ 63 OR INKEY$
=CHR$ 115 THEN GO TO 900
740 GO TO 680
750 LET B=B+Z+1
760 LET GUESS=GUESS+X(A,B)
770 LET D(A)=15-A+B
780 PRINT OVER 1: PAPER 3: AT E(
A),D(A): " "
790 NEXT A
900 REM TO CLEAR INKEY$ BUFFER-
-----
910 PAUSE 1
1000 REM Displaying programs rou
te-----
1010 FOR A=1 TO 12
1020 PRINT OVER 1: PAPER 4: AT U(
A),H(A): " "
1030 NEXT A
1035 REM Clearing screen bottom-
-----
1040 FOR B=10 TO 20
1050 FOR A=1 TO 30
1060 PRINT PAPER 0: AT B,A: " "
1070 NEXT A: NEXT B

```

560 Gosub and plot player's help route.
600-615 Set up for player's guessing.
620 Gosub and print totals.

650-740 Check player's keys and take appropriate action.
1000-1030 Display the computer's route.
1040-1070 Clear the bottom of the screen.

Which book would your micro want you to buy? PCN's review page helps you choose.

'Using the 64' by Peter Gerrard, published by Duckworth at £9.95 (paperback, 328 pages)

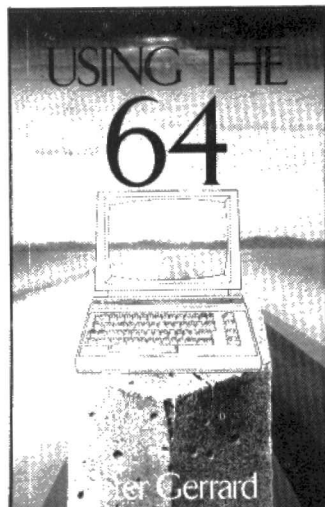
Owners of the Commodore 64 are now on the receiving end of a veritable landslide of books, software and peripherals — for which I'm sure they are truly grateful. This does, however, bring with it the problem of sorting out the gems from the dross.

In this case, we are dealing with a gem of a book. It deserves a place on the bookshelves of every 64 user whether beginner or expert.

There is an excellent introduction to 6502/6510 machine code, plus superb sections on sound and sprites, as well as a rundown on the full graphics facilities on the 64. These sections are far superior to Commodore's own in terms of readability, although the latter does give more information.

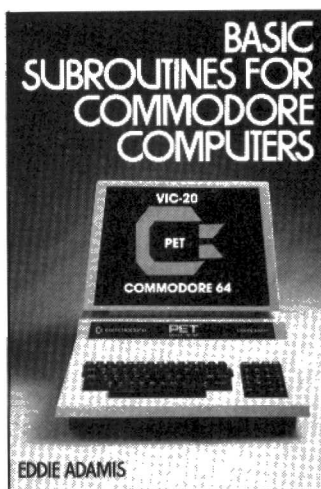
The second part of the book contains a wealth of technical information on the many dedicated chips in the 64 and while this will undoubtedly be beyond the grasp of most users, it is nice to have the information available in one source.

At £9.95 it is more costly than the usual run of 64 titles but at 328 pages (including an indispensable index) it provides good value for the money. Highly recommended. **PW**



'Basic Subroutines for Commodore Computers' by Eddie Adamis, published by John Wiley & Sons at £10.50 (paperback, 312 pages).

The main question pertinent to this book is why it has been published. There have been a number of subroutine compendiums in the past and this one seems to offer little that's new.



The fact that all the programs are written in Commodore Basic is of little merit since the earlier titles are all in standard (Microsoft) Basics and this one uses no commands or control codes peculiar to the Commodore machines.

More critically, the routines on offer are spectacularly dull. They may be of interest to users of business Pets, but will probably be of little interest to the average 64 or Vic owner. Most are of scientific or mathematical bias covering such subjects as area, capacity, energy and temperature conversions, statistics and word and number sorts.

The physical size of the book is misleading too. Almost a third of the pages are taken up by screen dumps of the programs in action and while a little of this is useful, too much looks like a waste of space.

There are about 300 routines here, each accompanied by a clear explanation of the code, and for programmers who really need a wide variety of routines of this nature the book will no doubt be useful.

But for the average micro user there's not much of interest. **PW**

'Data Base Management for the Apple' by N Wadsworth, published by Hayden Book Company Inc, distributed by J Wiley at £12.95 (paperback, 122 pages).

In the literature relating to micros, where so many books provide dozens of more or less useful programs, a book that concentrates on only one program would appear to be a rip-off. But not in the case of 'Data Base Management'.

The author starts with an introduction to the concept of

controlling information, and then proceeds to describe how the database is structured. The author explains very well a difficult subject in layman's terms.

The Data Base Manager program listing covers a mere five pages, which is important because the database resides in the RAM when in use.

Using the program is made very easy by the presence of a primary and secondary menu. The primary menu enables the major functions of defining the file format, reading a file from or writing to disk, cataloguing disks and erasing files.

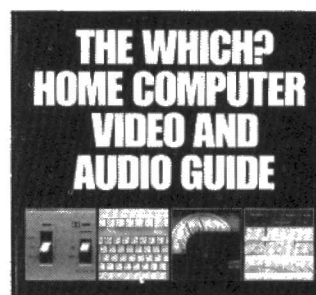
The secondary menu allows record changes such as additions, subtractions and corrections as well as containing the search facilities.

The section on applications is aimed predominantly at home use with a few more business oriented examples. Not so usual is the extent to which the adaptation of the program to these applications has been described.

For the more advanced students of microcomputing, a detailed explanation of the program's structure is given.

The suggestions altering various routines, contained in the last chapter, are useful but only go so far. When it comes to transferring routines into machine code the author draws the line and suggests further reading.

Considering the price of similar software in disk form, the book is reasonably good value. Particularly because of the versatility and adaptability of the 'Data Base Manager' program. It is not, however, intended for databases that are larger than a few thousand records, without machine code amendments. **LB**



'The Which? Home Computer, Video and Audio Guide', edited by Quentin Deane, published by Consumers' Association and Hodder and Stoughton at £6.95

The run-up to Christmas is the traditional time for publishers to produce guides to the consumer jungle. But in all jungles, there are times when you ask for a machete and someone hands you a teaspoon. Unfortunately, this book is in nothing like the great tradition of the Consumers' Association.

What it does give you is a very basic — and at some points misleading — guide to what computers are all about, and what you might want one for. It's sorted into chapters with sub-headings, at the end of which you get a few lines headed 'Buying Guide'.

These 'guides' lack the pithiness of the standard *Which?* summaries. For example: 'If you intend to run mainly bought software then the limitations of the built-in Basic do not matter too much; if you want to write your own programs, the more commands there are for handling words and numbers, the better.' Is this really a recommendation to budding programmers to buy a machine without built-in Basic?

This particular *Which?* guide covers — as you may have deduced from the title — video and audio as well. The press release accompanying the review copy was deeply unconvincing on why this should be, but it would seem that the book is aimed at the consumer goods junkie who has little or no knowledge of the various fields covered.

In the first place I don't think this is a particularly fruitful line of enquiry, and in the second I don't think nearly enough hard consumer information has been included.

Far better to be 'baffled by the terminology or swept along on a tide of uncritical journalism.' That way, you'll eventually pick up some facts. **JL**

sinclair special

5



*Inside...
New Interface 2
and ROM cartridges!
New Software!*

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX[®] assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

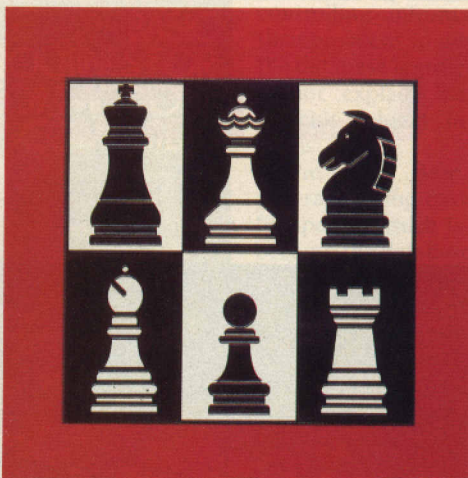
You may well have heard news of ZX Interface 2[®] and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX[®] Computers



Chess Tutor 1

For 48K RAM Spectrum. £9.95.

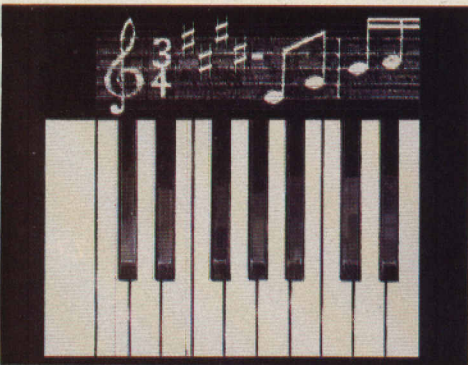
Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.[®]

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.



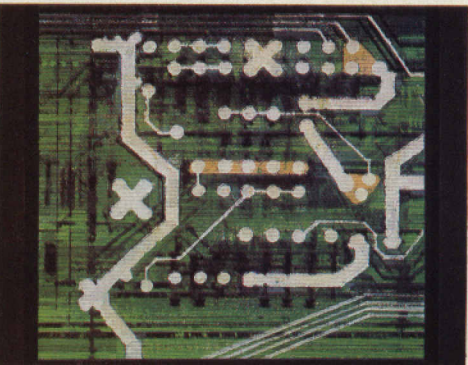
Musicmaster

For 48K RAM Spectrum. £9.95.

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.



Make-a-Chip

For 48K RAM Spectrum. £9.95.

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

Make-a-Chip is a fascinating way of finding out how computer logic works.

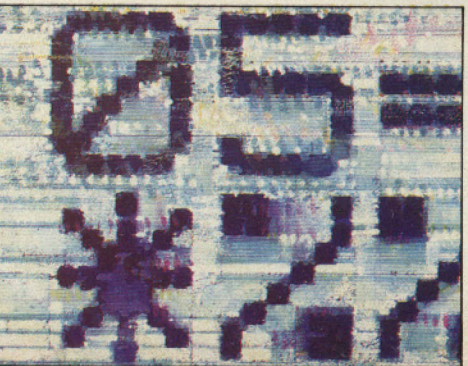


Print Utilities

For 16K and 48K RAM Spectrum. £9.95.

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC

For 48K RAM Spectrum. £9.95.

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

**Loads programs instantly!
Takes two joysticks!
Just plug-in and play!**

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!



£19.95

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AND
ROM CARTRIDGE
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...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help

him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess



This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chess-board and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Backgammon



Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base

to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves

fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace



Horace is forever being chased around the park by guards. He steals their lunch, eats path-

way flowers and creates chaos in the park by ringing the alarm! You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am



Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession

of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders



Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie



You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they

bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

New! Jet Pac



As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship

kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

ZX MICRODRIVE



NOW ON RELEASE

The ZX Microdrive[®] System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, and a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

How to get ZX Microdrive
Spectrum owners who bought direct from us, by mail order, have been

sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

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Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
TOTAL £				

Section B: Software ROM CARTRIDGE PROGRAMS

	G12/R Planetoids	5302	14.95	
	G9/R Space Raiders	5300	14.95	
	G13/R Hungry Horace	5303	14.95	
	G24/R Horace and the Spiders	5305	14.95	
	G28/R PSSST	5307	14.95	
	G30/R Cookie	5309	14.95	
	G29/R Tranz Am	5308	14.95	
	G27/R Jet Pac	5306	14.95	
	G22/R Backgammon	5304	14.95	
	G10/R Chess	5301	14.95	

ORDER FORM

CASSETTE PROGRAMS for ZX Spectrum

E9/S	Chess Tutor 1	4308	9.95
E7/S	Musicmaster	4306	9.95
E8/S	Beyond BASIC	4307	9.95
E6/S	Make-a-Chip	4305	9.95
L5/S	Print Utilities	4404	9.95

TOTAL £

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no:

*Delete/complete as applicable.

Signature

Mr/Mrs/Miss

Address

PCN 911

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, and send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ (tick here). You can use the above form to send us your name and address.

DATABASICS

PCN Databasics is presented in three-week cycles. This week it's the turn of software packages, next week hardware, and two weeks from now, peripherals... We can't fit all software packages in, so we've compiled a selection, giving best sellers from 100 publishers and distributors.

We confined coverage to five main types of applications: business, education, games, home and utility. All details published are the latest available.

Companies wanting to add their best-selling packages to Databasics, or wanting to update information already here, should send details to: Databasics, *Personal*

Computer News, VNU, 62 Oxford Street, London W1A 2HG.

APPLICATION Each software package is listed alphabetically by its application. **PRICE** includes VAT.

MACHINE/OPERATING SYSTEM on which the best selling packages runs.

OTHER VERSIONS indicates whether or not the package runs on a different machine or operating system.

MEDIA SUPPLIED indicates in what format the package comes — either cassette, disk, or cartridge.

MAIL ORDER AVAILABLE tells you whether or not the package is available by mail order.

HARDWARE REQUIRED shows the need for special hardware, such as disk drive, joystick or printer.

PUBLISHER/DISTRIBUTOR This code refers to the distributor code table at the end of the listings, which will give the name and telephone number of the publisher/distributor.

COMMENTS — any other points of interest.

SOFTWARE

BUSINESS

	Price Inc vat	Machine/Operating System	Other versions	Title	Memory required	Media Supplied Cassette Disk Cartridge	Mail order avail.	Hardware Required Disk drive Joystick Other	Publisher/Distributor	Comments
Accounting										
	£3,320	Apple II	●	Financial Controller	48K	●		●	S1	Also on Apple IIE. 8 modules (£402.50 each) — sales, purchase, invoicing, etc.
	£339.25	Apple II		General Ledger	48K	●	●	●	C1	Supports 1000 accounts and 100 analyses. Self-balancing, full audit trail.
	£552	Apple II		Informex Integrated Accounting System	48K	●	●	●	I1	Contains nominal, sales, purchase ledger + VAT. Can handle 800 accounts.
	£1,147.70	Apple II		Informex Integrated Business System	48K	●	●	●	I1	Contains accounting system modules plus invoicing + stock.
	£172.50	Apple II	●	Micro-General Ledger	48K	●	●	●	G1	Also on ITT 3030 and Basis 108. Goes through profit/loss + balance sheets.
	£402.50	Apple II	●	Nominal Ledger	64K	●	●	●	J1	Also on Sirius, IBM PC, Apple III + UCSD. Requires 132 column printer.
	£431.25	Apple II		Payroll	48K	●	●	●	C1	Supports weekly, monthly, + per monthly. Up to 350 employees per disk.
	£402.50	Apple II	●	Purchase Accounting & Cost Control	64K	●		●	J1	Requires 132 column printer, also Sirius, IBM PC, Apple III, UCSD.
	£402.50	Apple II	●	Sales Accounting System	64K	●		●	J1	Also on Sirius, IBM PC, UCSD. Provides conventional ledger.
	£339.25	Apple II		Sales Ledger	48K	●	●	●	C1	Supports 700 + accounts. Direct posting, credit control & 100 analyses, self balancing
	£1,725	Commodore 8000	●	Auditman	32K	●	●	●	C4	Also on Commodore 4000. Complete accounts production system.
	£2,052.75	Commodore 8000		Data-Lex	32K	●	●	●	D1	Designed for solicitors + others who need to separate office & client's accounts.
	£2,070	Commodore 8000	●	Microfacts	32K	●		●	M1	Also on Commodore 700, Victor & Sirius. £345 per module. Integrated accounting.
	£454.25	Commodore 8000	●	Micro-simplex	32K	●		●	M2	Also on Commodore 64 (£172.50). Needs printer. For smaller retail business.
	£2,300	Commodore 4000	●	Pegasus Integrated Accounting Suite	32K	●		●	P3	Also on MS-DOS (128K). Contains six stand alone modules.
	£116.00	CP/M	●	CalcStar 1.4	160K	●		●	M10	Also on IBM PC. MS-DOS. Integrates with WordStar and InfoStar.
	£1,437.50	CP/M		Aurora Integrated Accounting Package	64K	●	●	●	G1	Five stand alone modules. Sales, invoicing, purchase, nominal and stock.
	£2,760	CP/M		Boss	64K	●	●	●	F1	Seven stand alone modules. Can link to Autowriter & Autoindex.
	£805	CP/M	●	Cash Book Accounting	64K	●		●	S2	Also on CP/M-86 and MS-DOS. Amalgamation of sales, purchase & nominal ledger.
	£2,300.00	CP/M		dBflex	48K	●	●	●	E1	Open item six module accounting system. (£575.00) per module. Works with dBase II
	£402.50	CP/M	●	Exact	64K	●	●	●	S3	Also on MS-DOS. Includes six modules — invoicing, ledgers, stock and payroll.
	£1,840	CP/M	●	ISBS-S	48K	●	●	●	G2	Also on CP/M-86. Contains seven modules.
	£2,271.25	CP/M	●	Multi-Index	64K	●	●	●	B1	Also on MP/M & PC-DOS. Contains five modules. Sales, nominal, VAT & stock control
	£569.25	CP/M	●	Nucleus	64K	●	●	●	C2	Also on MS-DOS. Disk drives of 280K needed. A program generating system.
	£1,431.75	CP/M		Padmede Business Control System	64K	●	●	●	P2	Five modules (£286.35 per module). Nominal, sales, purchase, invoicing, stock.
	£1,380	CP/M	●	Motor Dealers Part Distribution	64K	●	●	●	S2	Also on CP/M 86 & MS-DOS. Combines stock control, order processing ledgers.
	£1,868.75	CP/M	●	Peachtree Basic Accounting Systems	48K	●	●	●	P1	Also on MP/M & M2-DOS. Available on hard disk (£2,156.25). 5 stand alone modules.
	£287.50	CP/M	●	Sales Ledger	64K	●	●	●	S2	Also on CP/M 86 and MS-DOS. Flexible ledger system.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Cassette Disk Cartridge	Mail order avail.	Hardware Required Disk drive Joystick Other	Publisher/ Distributor	Comments
	£45.42	Sharp MZ80A	●	Easy VAT	48K	●	●	●	K1	Also on Sharp MZ80B & M200K. VAT record system.
	£2,460	MS-DOS	●	Hal-line Integrated Accounting Suite	64K	●		●	H6	Also available on PC-DOS, HAI-BAS, CP/M.
Agriculture	£1,150	Apple II		Dairy Package	64K	●	●	●	F2	Available on floppy or hard disk. Files individual cow production, with herd summaries
	£1,150	Apple II		Management Program	64K	●	●	●	F2	Available on floppy or hard disk. Monitors individual field activities, budgets, etc.
	£35	Newbrain		Agricultural Field costings	32K	●	●	●	P8	Field data costings
Bill of Materials	£373.75	CP/M	●	Fastbill	60K	●	●	●	T2	Also on MS-DOS & TRS-DOS. Will give parts explosion at 10 levels, 99 items/level.
Bookkeeper	£56.35	Apple II		Apple Bookkeeper	48K	●	●	●	H1	Needs printer. Keeps petty cash, sales, other business books, sorts, analysis etc.
Building Specifications	£460	Commodore 8000	●	National Building Specifications	32K			●	C3	Also on Commodore 4000. Used with Wordcraft. Produces building specifications.
Business Graphics	£471.50	16-bit machines		Micro-Graphpower	128	●	●	●	I2	Needs plotter. Business graphics which plots business data.
	£120.75	Apple III	●	Business Graphics	48K	●	●	●	P6	Also on Apple II (£125.35). Supports range of plotters & pie-charts, etc.
	£149.50	IBM PC	●	Graph Magic	96K	●	●	●	F1	Also on Apple II, III. Displays files graphically. Reviewed 18.3.83.
Business Management	£569.25	Commodore 8000		The Administrator	96K	●	●	●	S11	Complete applications generator. No programming required.
	£4,140	CP/M		Peachtree Business Management System	48K	●	●	●	P1	Also on MP/M & Unix. Available on hard disk (£6,900). Six modules for single user.
	£684.25	IBM PC	●	Tomorrow's Office	128K	●	●	●	S11	Also on Sirius, Victor & MSDOS. Complete applications generator.
Cash Book	£224.25	Commodore 4000	●	Electronic Cash Book	32K	●	●	●	D1	Also on Commodore 8000 & 64. For small business or add-on products.
Cataloguing	£46.00	Apple II		Floppy Cat	48K	●	●	●	P4	Enables user to catalogue & store all information.
	£35.00	Newbrain		Dentists NHS Schedule	32K	●		●	P8	Aid for checking statutory returns.
Estate Agents	£1,092.50	Apple II		Commercial Agency Systems	48K	●	●	●	C7	Matches in both directions with lists, labels and letters.
	£977.50	Apple II	●	Cydepress Clients Recoverable Costs	48K	●	●	●	C7	Also on Rair Black Box. Designed to keep record of incurred expenditures.
	£1,121.00	Apple II	●	Cydepress Residential System	48K	●	●	●	C7	Also on Rair Black Box. An applicant & property matching system.
	£419.75	CP/M		Estate Agents Match & Mail	56K	●	●	●	S4	Matches & prints out potential customers for every property.
Financial Accounting	£569.25	Commodore 8000	●	Finplan	32K	●	●	●	M3	Also on Commodore 3, 4, & 8000, Vic-20 and Commodore 64, £46.57 on floppy disk
	£287.50	Commodore 8096		The Financial Director	96K	●		●	D1	Designed to handle large & complex planning & financial applications.
Financial Planning	£44.85	Commodore Pet		Busicalc	16K	●	●	●	S5	Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£188.60	Apple II	●	VisiCalc	48K	●	●	●	R1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£345.00	CP/M		Bottom-Line Strategist	48K	●	●	●	P4	A business/project forecasting program. Allows user to test business assumptions.
	£281.75	CP/M	●	Master Planner	64K	●	●	●	C5	Also on MS-DOS & CP/M 86. Needs 80 column printer. Upgrade of a spreadsheet.
	£396.75	CP/M	●	Micro Plan	64K	●	●	●	B1	Also on MP/M. Spreadsheet financial planner.
	£343.85	CP/M		Minimodel Financial Modelling	48K	●	●	●	G1	Needs 80 column screen. Model consolidation facility, colour option.
	£182.85	CP/M	●	Multi-Plan	48K	●	●	●	P4	Also on PC-DOS, Cromix, Fortune, Corvus & Sirius. Second generation spreadsheet.
	£44.85	CP/M		Plannercalc	64K	●	●	●	C5	Needs 80 column screen. Entry level system for spreadsheet planning.
	£218.50	CP/M		SP2020	48K	●	●	●	G2	Forecast effects of proposed actions. Aid to management decision-making.
	£172.50	CP/M		Supercalc	128K	●	●	●	A1	Electronic worksheet, representing a large flexible accounting work pad.
	£212.75	CP/M		Super Calculator	48K	●	●	●	E1	Spreadsheet calculator.
	£178.25	CP/M		T-Maker	48K	●	●	●	L1	Utility for analysis & presentation of numerical data & test material.
	£224.25	MS-DOS		Pulsar Business System	128K	●	●	●	A1	Consists of eight integrated packages & provides commercial accounting functions.
	£339.25	Osborne	●	PADA/C	64K	●	●	●	P2	Also on CP/M. Two systems. Incomplete records accounting, time/cost recording.
	£632.50	UCSD-P System		Microfinesse	128K	●	●	●	P5	Financial modelling program for businessmen.
	£741.75	UCSD-P System	●	Micro-Modeller	48K	●	●	●	I2	Also on CP/M & MS-DOS. Designed for large corporations.
Industrial Costing	£747.50	Apple II	●	Stock & Production Costing	48K	●	●	●	A2	Also on Apple IIE & III & Sirius. Available on hard disk. Needs Pascal system.
Insurance Accounting	£1,380	Commodore 4000	●	Insurance Man	32K	●	●	●	C4	Also on Commodore 8000, provides insurance broker with sales ledger.
Insurance Broking	£5,462.50	ICL DRS20		HS-100	64K	●	●	●	H2	Requires 16 or 27 Mb hard disk to run off. Maintains

	Price inc vat	Machine/Operating System	Other versions	Title	Memory required	Media Supplied	Hardware Required	Publisher/Distributor	Comments
Business Game	£9.95	BBC Model A	●	Business Game	16K	●		W1	Also on Model B. Two games for economics, business & general studies, teaching.
	£5.95	BBC Model B	●	Inkosi	32K	●		C9	Also on Vic-20. Rule for ten years, overcoming obstacles, e.g. famines.
Chemistry Children	£14.38	Research Machine 380Z	●	Symbols To Moles	31K	●	●	H4	Also on Apple II. Practise using chemical symbols, writing & mole concept.
	£37.89	Apple II	●	Bumble Plot	48K	●	●	P4	A set of five programs for developing graphics and maths skills. For children 8 to 13.
	£29.84	Apple II	●	Face Hanger	48K	●	●	P4	Also on IBM PC. Designed for children to learn computer keyboard by building up face.
	£37.89	Apple II	●	Gertrude's Secret	48K	●	●	P4	An educational game to teach logical thinking & planning. For children aged 6-9.
	£9.80	Atari 400	●	Jigsaw Puzzles	16K	●		T4	Also on Atari 800. Has 16 puzzles and optional difficulty.
	£9.95	BBC Model B	●	Letters	32K	●	●	C9	Designed for children aged 4-6 & for dyslexic & remedial children.
	£9.95	BBC Model B	●	Metrics	32K	●	●	C9	Also on Vic-20+ Spectrum. Structure of metric system. For children aged 10-15.
	£5.95	BBC Model B	●	Pascal	32K	●	●	C9	Also on Vic-20. Shows construction of Pascal Triangle and tests on it.
	£5.95	BBC Model B	●	Sequences	32K	●	●	C9	Also on Vic-20. Demonstrates number patterns.
	£6.50	BBC Model B	●	The Early Stages	32K	●	●	H3	Reading aid. Plays nursery rhymes. Available on disk.
	£4.50	BBC Model B	●	Super Hangman	32K	●	●	I4	Version of famous game. High resolution graphics. 800 words or enter own choice.
	£9.95	BBC Model B	●	Tree of Knowledge	32K	●	●	A9	Interactive program teaching categorisation. Simplified information retrieval.
	£4.95	Sharp MZ80A	●	Giant Maths	32K	●	●	S8	Also on MZ80K. Big screen figures & humorous error messages. 5 to 11 years.
	£4.95	Sharp MZ80A	●	Rocket	3K	●	●	S8	Also on MZ80A. Four difficulty levels. For five to 11 year olds.
	£9.20	Sharp MZ80A	●	Teach Tables	48K	●	●	K3	Also on MZ80K. Plays like game but motivates children to improve their ability.
	£4.95	Sharp MZ80K	●	Master Builder	48K	●	●	S8	Also on MZ80A. Repair a wall using random blocks. Teaches spacing.
	£5.25	Spectrum	●	Alphabet	48K	●	●	W2	'Picture for each letter of the alphabet. Option for lower case.' Aimed at ages 2-6.
	£5.25	Spectrum	●	Adding and Subtracting	16K	●	●	W2	For children aged 3-7. Three animated programs with full graphics.
Classroom Monitor	£322.00	UCSD-P	●	Classroom Monitor	64K	●	●	K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.
Economics	£28.75	Sharp MZ80K	●	Broadwater Economics Simulation	16K	●	●	W1	Also on Commodore Pet & BBC. Simulates micro & macro economics.
French	£14.38	Research Machine 380Z	●	Repondez	31K	●	●	H4	Also on Apple II. Practising French verb formation (present tense).
	£9.20	Sharp MZ80A	●	French Conjugate	48K	●	●	K1	Also on MZ80K. Automatically conjugates regular verbs into tenses.
	£9.20	Sharp MZ80A	●	French Verbs	48K	●	●	K1	Also on MZ80K. Allows user to impart up to 20 verbs & eight tenses at a time.
Graphics	£8.00	BBC Model B	●	Painter	32K	●	●	A5	Also on Spectrum (£5.75). Atom (£6.90) & on disk.
	£9.95	BBC Model B	●	Creative Graphics	16K	●	●	A9	Book available (£7.50). Designed to illustrate BBC graphics.
	£20.13	Sharp MZ80A	●	Kings & Queens	48K	●	●	K1	Also on MZ80K. Facts & figures on English monarchs since 1066.
History	£7.95	Sharp MZ80A	●	Multilingualist	3K	●	●	S8	Also on MZ80K. A language tutor to suit all European languages.
Languages	£8.95	BBC Model B	●	Angle	32K	●	●	C9	Also on Spectrum. Includes four programs designed to teach simple geometry.
Mathematics	£9.95	BBC Model A	●	Algebraic Manipulations	16K	●	●	W1	Also on Model B. Includes four programs designed for use in maths teaching.
	£82.80	IBM PC	●	Fact Track	64K	●	●	I3	Learning basic arithmetic. Presents simple two-line sums in random order.
	£9.20	Sharp MZ80A	●	Directed Numbers	48K	●	●	K3	Also on MZ80K. Teaches difficult mathematical functions.
	£9.20	Sharp MZ80A	●	Divisor Advisor	48K	●	●	K3	Also on MZ80K. Teaches division at a variety of skill levels.
	£27.60	Sharp MZ80A	●	Numerical Integration	48K	●	●	K3	Also on MZ80K & B. Teaches Simpson's Rule.
	£5.25	Spectrum	●	Counting	16K	●	●	W2	Graded programs. 'Good as a first introduction to numbers.' Aimed at ages 3-6.
Meteorology	£23.00	Research Machines 380Z	●	Weather	31K	●	●	H4	Also on Apple II. Gives synoptic charts. Teaches elementary meteorology.
Morse Code	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●	●	K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
Physics	£14.38	Research Machines 380Z	●	Lenses	31K	●	●	H4	Also on Apple II. Illustrates formation of images by lenses using ray diagrams.
	£9.20	Sharp MZ80A	●	Casino Chips	48K	●	●	K3	Also on MZ80K. Uses radioactive chips to teach half-life concept.
	£3.00	Sharp MZ80A	●	Physics 1 and 2	20K	●	●	D6	Also MZ80K. O' level electricity and motion.
Typing	£28.75	CP/M	●	Touch'n'Go	48K	●	●	C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Qwerty keyboard.
	£31.05	IBM PC	●	Typing Tutor	64K	●	●	I3	Presents exercises for learning touch typing or for improving existing skills.

GAMES

Adventure	£17.95	Atari	●	Arrow of Death	16K	●	●	C8	Also runs on TRS-80, BBC, Vic-20. A 'classic text adventure'.
	£7.99	BBC Model B	●	Adventure	16K	●	●	M7	Also runs on Atom. 'Many rooms to explore and many hazards to overcome'.
	£9.95	BBC Model B	●	Philosopher's Quest	16K	●	●	W1	'Progress through a world of fiendish puzzles.'
	£9.95	BBC Model B	●	Sphinx	16K	●	●	W1	'A classic adventure, moving through caves avoiding hazards to collect treasure'.
	£13.80	Commodore Pet	●	Hitch-Hikers Guide to the Galaxy	32K	●	●	S5	Also runs on Commodore 64, Vic-20, 3000, 4000, 8000. 'Involved, textual game'.
	£18.40	Commodore Pet	●	Pythonesque	32K	●	●	S5	'Increasingly difficult textual game based on Monty Python'. Disk available (£20.12).
	£24.99	Commodore Vic-20	●	River Rescue	8K	●	●	T4	Needs joystick. 'Captain boat through treacherous rivers to rescue explorers'.

	£24.95	BBC Model B	EDG Graphics Package	32K	●	●	●	●	●	●	S7	Computer aided design package. Reviewed 11.3.83.
Language	£50.60	CPM	CP/M Graphics	64K	●	●	●	●	●	●	D4	Range goes up to £421.70 & conforms to GKS Graphics Standard.
	£488.75	CPM	CIS Cobol	64K	●	●	●	●	●	●	M11	Also on Unix. Compact, interactive ANSI 74 standard implementation of Cobol.
	£1,109.75	CPM	Level II Cobol	96K	●	●	●	●	●	●	M11	Also on Unix & MS-DOS. High level ANSI 74. Compiler, mainframe-compat code.
	£396.00	CPM	Fortran 80	48K	●	●	●	●	●	●	T2	Useful for scientific applications, where Pascal is inefficient.
	£285.20	CPM	Pascal — MT +	64K	●	●	●	●	●	●	X1	ANSI standard Pascal for Z80 processors. Also on CP/M 86 (£484-90).
Linker	£210	CPM	Supersoft C Compiler	48K	●	●	●	●	●	●	M4	Also on CP/M-86, MS/DOS, PC, DOS. Fast implementation of C.
	£114.43	Commodore 64	DTL-Basic Compiler	32K	●	●	●	●	●	●	D1	Also on Commodore 8000, 4000 & 3000. Also tape version on CBM 64 (£39.96).
	£16.85	BBC Model A	Lisp on the BBC	16K	●	●	●	●	●	●	W1	Also on BBC Model B. Book available £7.50. Lisp is artificial intelligence language.
	£253.00	CPM	ProPascal	56K	●	●	●	●	●	●	E1	Also on CDOS. Needs two disk drives. Native code Pascal.
	£40.19	Sharp MZ80A	Forth	48K	●	●	●	●	●	●	K1	Also on MZ80K & Osborne. Allows implementation of Forth.
Operations	£25	Spectrum	Hisoft Pascal	48K	●	●	●	●	●	●	H5	Reviewed in PCN week ending April 8. Pascal compiler and screen editor.
	£421.70	Any 8 or 16 bit machine	PL/1	48K	●	●	●	●	●	●	D4	A compact implementation based on ANSI standard general purpose subset of PL/1.
	£350.75	IBM PC	Lattice-C	64K	●	●	●	●	●	●	L1	Also on MS/DOS, C. Compiler for 16 bit machines — full implementation & execution
	£172.50	UCSD p-System	UCSD Pascal	48K	●	●	●	●	●	●	D4	Portable Pascal for systems development or commercial applications.
	£224.25	CPM	Plink 2	48K	●	●	●	●	●	●	L1	Up to 8 megabytes.
Operating system	£59.80	CPM	Operating Guide	48K	●	●	●	●	●	●	E1	Works by putting CP/M to sleep & replacing it with operating environment.
	£22.94	Apple II	Fasdos	48K	●	●	●	●	●	●	P4	Disk operating system for Apples which speeds up location of binary & Applesoft files.
	£277	8086 micro	Concurrent CP/M-86	48K	●	●	●	●	●	●	T2	Enables four separate tasks to run in a single user station.
	£431.25	Many processors	UCSD p-System	48K	●	●	●	●	●	●	D4	Portable user-friendly operating system including one compiler.
	£126.50	8080 and Z80 micros	CP/M 2.2	64K	●	●	●	●	●	●	D4	O/S for 8-bit micros with over 1.5 million users.
Program Generator	£379.50	8080 and Z80 micros	MP/M	64K	●	●	●	●	●	●	D4	Multiuser, multitasking. Features record & file locking, date & time stamping etc.
	£210.80	8086 and 8088 micros	CP/M-86	64K	●	●	●	●	●	●	D4	Manages up to one megabyte of RAM & allows up to 128 megabytes of on-line storage.
	£548.20	8086 and 8088 micros	MP/M-86	64K	●	●	●	●	●	●	D4	Multi-user. Multi-tasking. Multi-user capability with multi-programming for each user.
	£168.70	8080, Z80, 8086 and 8088 micros	CP/Net	64K	●	●	●	●	●	●	D4	A CP/M compatible O/S designed to access local & networked resources.
	£295.20	Motorola MC68000	CP/M 68K	64K	●	●	●	●	●	●	D4	Extends CP/M to Motorola MC68000 microprocessors. Single user, single tasking.
Programming Tool	£228.85	Apple II	Quickcode	64K	●	●	●	●	●	●	P4	Also on IBM PC. Program generator for dBase II.
	£126.50	CP/M	Forms-2	64K	●	●	●	●	●	●	M11	Also for Unix & MS-DOS. Programming tool, for generating Cobol code.
	£379.50	CP/M	Last One	64K	●	●	●	●	●	●	S3	Also on MS-DOS and Apple DOS.
	£2,500	Apple II	Pascal Isam Pascal Form	48K	●	●	●	●	●	●	A4	Also on IBM PC & Corvus Concept. Needs Corvus hard disk. Pascal prog tool.
	£287.50	CP/M	Flieshare	48K	●	●	●	●	●	●	M11	Also on MP/M. Bank-switched memory or CP/M network.
Telex	£7.95	Dragon 32	Dragon Selection 2	32K	●	●	●	●	●	●	D3	Four utility programs which can be listed to see how the program works.
	£4.00	Sharp MZ80A	Tape Copier	48K	●	●	●	●	●	●	D6	Back-up copier for BASIC and machine code.
	£2,113.70	Superbrain	Micro Telex	64K	●	●	●	●	●	●	E1	Also on Telexvideo 802. Enables automatic sending-receiving or telex by micro.
	£95.82	CP/M 80	Diagnostics II	32K	●	●	●	●	●	●	M4	Also on CP/M-86 and MS/DOS. Tests systems.
	£862.50	Commodore 8000	Minuteman	32K	●	●	●	●	●	●	C4	Also on Commodore 4000. Time recording system. Can produce range or reports.
Utilities	£402.50	CP/M-86	Time Recording System	64K	●	●	●	●	●	●	D2	Also on CP/M 80. Control over man/hour expenditure by job or account number.
	£23.00	Apple II	Computech Utilities Disk II	48K	●	●	●	●	●	●	C1	Also on Apple IIe. Error checking, copying. Single disk copy. Label disk.
	£115.00	IBM PC	C-Food Smorgasbord	64K	●	●	●	●	●	●	L1	Decimal arithmetic, low level & terminal independent input & output.
	£79.35	CP/M	Visa 80	64K	●	●	●	●	●	●	M13	Constructs a menu-driven system to your design.
					●	●	●	●	●	●		

A1 ACT Pulsar, 021-454 8585 **A2** Advanced Quality Software, Norwich 21117 **A3** Audiogenic, Reading 595647 **A4** Atlantic Software, Nottingham 412777 **A5** A & F Software, 061-223 6206 **A6** Abex Electronics, 01-203 1465 **A7** Automata UK, Portsmouth 735242 **A8** Apex Trading, Brighton 36894 **A9** Acornsoft, Cambridge 316039

B1 Bonsai, 01-580 0902 **B2** Bristol Software Factory, Bristol 23430 **B3** Bug-Byte, 051-227 2299 **B4** Bytesoft, 0480-215005 **B5** Bellflower software, 01-903 1816

C1 Computech Systems, 01-794 0202 **C2** Compact Accounting, Dorking 887373 **C3** Claremont Controls, Rothbury 21081 **C4** Computer Services Midlands, 021-382 4171 **C5** Comshare, 01-222 5665 **C6** Caxton Software, 01-379 6502 **C7** Cyderpress, Wellingford 37769 **C8** Channel 8 Software, Preston 53057 **C9** Chalksoft, Wellingford 7117 **C10** Construction Computing Services, Byfleet 47541

D1 Dataview, Colchester 869414 **D2** DEC, Basingstoke 59200 **D3** Dragon Data, Kenfig Hill 744700 **D4** Digital Research, Newbury 35304 **D5** Dipar Software, 0329 46756 **D6** David Computer Software, 061-439 4841

E1 Encotel Systems, 01-686 9687 **E2** Elisree Computer Centre, 01-953 6921

F1 Ferrari, 01-751 5791 **F2** Farmplan Computer Systems, Ross-on-Wye 64321

G1 Great Northern, Leeds 589980 **G2** Graffcom Systems, 01-727 5561

H1 Hilderbey, 01-485 1059 **H2** Harford Software, Northwich, 781156 **H3** H & H Software, Runcom 65566 **H4** Heinemann, 01-637 3311 **H5** Hisoft, Swindon 26616 **H6** Holland Automation, 06286 63695

I1 Informex, 01-318 4213 **I2** Intelligence (UK), 01-543 3711 **I3** IBM UK Product Services, Basingstoke 56144 **I4** UK Software, Blackpool 21555 **I5** Impact Software, 031-441 4257 **I6** Imagine Software, 051-236 6949

J1 Jarnan Systems, Tring 6841

K1 Kurma Computers, Maidenhead 71778 **K2** Kansas City Systems, Chesterfield 850357 **K3** Knights, Aberdeen 630526 **K4** Keen

Computers, Nottingham 412777 **K5** Kobra Micro Marketing, Henley-on-Thames 2512 **K6** Kemp Ltd., 01-444 5499

L1 Lifeboat, 01-836 9028

M1 MMS, Bedford 40601 **M2** Microsimplex, Macclesfield 615000 **M3** McDowell Knaggs & Associates, Worcester 612261 **M4** Micro Technology, Tunbridge Wells 45433 **M5** Micromedia, 01-843 9457 **M6** Mollimerx, Bexhill-on-Sea 223636 **M7** Micro Power, Leeds 683186 **M8** Melbourne House, 01-977 9160 **M9** Mercury Software, Darwen 776677 **M10** MicroPro, 01-439 5777 **M11** MicroFocus, Swindon 695891 **M12** Microdeal, St Austell 67676 **M13** Mediatech, 01-903 4372

O1 Owl Microcommunications, Bishops Cleeve 723848 **O2** Omicron, 01-636 6575

P1 Peachtree Software International, Maidenhead 32711 **P2** Padmede, Fleet 21892 **P3** Pegasus, Kettering 522822 **P4** Pete & Pam Computers, 01-769 1022 **P5** PE Consulting Group, Egham 34411 **P6** Personal Computers, 01-377 1200 **P7** PTRC, 01-836 2208

P8 Printivity, 02407-4906

Q1 Quicksilver, Southampton 20169

R1 Rabbit Terminals, High Wycombe 26271 **R2** Rabbit Software, 01-863 0833 **R3** R & R Software, Gloucester 502819

S1 Systematics International Microsystems, Haverhill 61121 **S2** SGS Software Products, 01-486 7498 **S3** Silicon Valley Trade, 01-242 2807 **S4** Southdata, 01-994 6477 **S5** Silversoft, 01-861 1166 **S6** Seed, Brownhills 378151 **S7** Salamander, Brighton 771942 **S8** Solo Software, Worcester 424152 **S9** Silversoft, 01-748 4125 **S10** Sinclair Research, Cambridge 353204 **S11** Stage One Software, Poole 735656 **S12** SBD Software, 01-870 9275 **S13** Starcade, 051-236 6628 **S14** Iain Stewart, 0259-60840

T2 Tamsays, Windsor 56747 **T3** TABS, Andover 5993 **T4** Thorn EMI, 01-836 2444 **T5** Texas Instruments, Bedford 63211

W1 John Wiley & Sons, Chichester 784531 **W2** Widgeit Software, 01-444 5285

X1 Xitan Systems, Southampton 334711

VIC-20 + C2N expansion board VIC1540, disk drive Vicfile Supercalc, Viemon, Programmers aid, books, 16K cartridge, superscreen tape. Tel: Reading 0734 871421 offers?

Wanted BBC Model A or B, in good condition, up to £300 paid for computer only, no software please. Tel: Jim 0202 518828.

Sorcerer professional computer for sale, 48K Word-pro, quality keyboard 64 x 30 VDU, RS 232, etc. £350. Interested? Write: Stephen Howd, 27 Echo Barn Lane, Earnham, Surrey GU10 4NQ.

Wanted high res colour monitor, disk drive for BBC, reasonable price please. Ken Mallison 28 (A) Ashtree Road, Oadby, Leics. Tel: 0533 717372.

TRS-80 LII 16K with recorder, monitor, leads, manuals and one cassette. £215, for quick sale. Tel: Frilford Heath 0865 390422 after 6.15pm.

Acorn Atom 12K + 12K, Fully expanded, BBC Basic board, Acorn WP ROM, Forth, Invaders, Chess, Soft VDU etc. £130. B/W Crofton Monitor, £30. Tel: Oxford 66984.

TRS 80 Model 1 level 2 48K, two disk drives, manuals, programs etc. £550. Tel: Wood, Bridlington 0262 77513.

Lynx 48K excellent condition, includes book, leads and game. £160, suitable for upgrading to 128K and CP/M. Tel: Ron Manson 0506-413491 or office 0506 31122.

Atari Disk software to swap, good selection, also three ROMs for sale, Miner, Soccer, Missile Command, any offers. Tel: Richy 051-220 8927.

Atari 400 48K Basic program recorder + over £1000's worth of software, including Sam, ET, Dig-Dug, £225 or near offer. Tel: David Keech 0908 75094.

16K Rampack for ZX81, still under guarantee, £15. Three cassettes, GB Ltd, Inca Curse, Break-out + Scramble, £7.50 for all three, both £20. Tel: 0632 533169.

VIC-20 plus tape deck, blank tapes, programmers reference manual, £80. Tel: Ron 01-451 0331.

Atari VCS, plus ten games, Space Invaders, Combat, Basketball, Shoot-out, etc. joysticks, £120 ono. 12 Weavers Terrace, Micklethwaite Road, Fulham, London, SW6 1QE. Tel: 01-381 3290.

Kelan engineering I/O port Spectrum, with project book, £16 ono or swap for Spectrum software. R MacKay, Brochrobbie Brora, Sutherland, Scotland KW9 6NE.

Apple II 48K + 2 disk drives (DOS 3.3), Epson printer interface, colour, etc., Manuals, books, + over £300 software, £575 for quick sale. Chorleywood 2680 (260-2680 from London).

BBC Model B 1.2 OS Torch disks Microvitec monitor etc. Cost £1,750. Perfect, little used, boxed, guaranteed. Will deliver London/Sheffield, £1,350. Tel: 01-948 5568.

Acorn Atom, 12K RAM, 12K ROM via printer interface user manual, PSV leads, three books and £25 worth of software, only £80. Tel: 0254 71151.

Epson HX-20 portable computer. Manuals, carrycase, micro-cassette unit, tapes. £390 ono. Tel: Saffron Walden 0799-24244 eves.

Centronics 739 dot matrix printer. Supports proportional spacing, underline, pin-addressable graphics etc. Cables to BBC and TRS 80 included. £250 ono. Tel: 01-777 3552 eves.

PCN Billboard

Mostek MDX cards. Z80CPU, ZXP10, 8K RAM plus card frame. Ideal second processor for hardware freak. Offers to 07016-4572 after 6pm.

Spectrum Software to swap 16/48K. Also, sell Intertron VC4000 plus ten cartridges. Any reasonable offer considered. Tel: Gareth, Knutsford 0565-2458.

Acetronic MPU 1000 plus 9 cartridges including Olympics, Invaders, Superhaze, Blackjack, Soccer etc. Worth £230. Asking £110 ono. Tel: Clacton 0255-74214.

Atari 400 16K recorder, Basic, joysticks and manuals. Lots of games, including Frogger, Pacman, Miner, offers around £295. Tel: Wareham 0929-51376 after 6pm.

BBC Model B owner wishes to swap hardware, software, books etc for similar Atari items, preferably Disk system, please phone Warrington 50485 for details.

Jupiter Ace wanted with or without 16K. Offers to Townsend, St Yan 71600 Paray France (85.81.29.75 Tel).

16K Vic-20 + C2N cassette + 3K super expander, 6 cartridges, over 20 cassettes, 6 books, excellent condition. Require £200 ono. Tel: 01-788 1753 after 5pm.

48K Spectrum for sale + joystick + compatible recorder + £90 software for only £200, or swap for Atari 400 48K + program recorder. Tel: Farnborough (Kent) 51463 (Jason).

ITT 2020, single drive plus controller in original packaging. Wordprocessing, games software and magazines. £500 ono or will split. Tel: Graham on 01-561 1606 eves.

Vic 20 16K cartridge C2N cassette, books, 3 cartridge games, 5 cassette games, excellent condition. £125 ono. Tel: 01-808 0096.

Spectrum 32K RAM pack (by Cheeta) fits perfectly on back of computer, cost £40, sell for £25 ono. Tel: 0928-71191 (Runcorn).

Atari 800 48K disk drive, Family budget, Data file, Computer books, Hand books, Missile Command, Zaxxon, Donkey Kong, Miner 204. £450 or swap for BBC B. Slough 32309.

Bargains G7000 games computer with two cartridges £35. ZX81 used twice £25. Both items excellent condition. Original boxes, buyer pays postage. 01-942 2715.

CBM 64 Cassette deck, Simons Basic software includes Hobbit, Hungry Horror, Mutant Camels, Gridrunner, Hover Bover, Motor Mania, Chess, Annihilator, Crazy Kong, £290. 3 Church Lane, Gt Harwood, Blackburn, Lancs. Tel: 884559.

Intellivision with voice module and 32 cartridges. Demon Attack, Tron, Space Spartans, Astromash. Worth over £700 open to offers. Tel: High Wycombe 38984 eve.

Atari VCS, five cartridges, Demon Attack, Berzerk, Space Invaders, Combat, Defender. Worth £210, accept £105. Tel: 061-7905939.

Wanted BBC B within guarantee, with software. Extras also considered. Ring Radlett 5501.

Sharp MZ-80A, software pack, 2 Pascals, Forth, dust cover, books, 12 months old, excellent condition, £390. Tel: Ayr 0292-286456 eves.

Osborne One unused. Complete CP/M Basic, Wordstar Mailmerge Supercalc, dual 100K floppies, integral monitor, 64K RAM, £1,000 including box diskettes. Tel: 04865-3406 (Surrey).

Vic-20 + 16K, cassette recorder, joystick, Vic revealed, adventure cartridge. Over 50 games' utilities. Still guaranteed. Offers. Also BBC B wanted in good condition. 0303-77154.

Lynx 48K. Excellent condition, still under guarantee, plus software, user magazines and printer interface. £190. Tel: 0524-415436. Swap for Comm 64 with cash adjustment.

Dragon Software. The King, Invaders Revenge, Shuttle, Storm, Space War, Planet Invasion, Caterpillar, Cosmic Zap, and lots more. £4.50 each. Tel: (eves) 0306-731002.

Newbrain Model AD, beginner's guide, all leads, original packing, 5 months old. Excellent condition. £195 ono. Tel: 0279-417303 after 6pm.

Newbrain AD. Unused. original packing, complete with power supply, handbook, all leads. Offers to Graeme Park, 27 Hallhill Road, Johnstone. Tel: Kilbarhan 4142 anytime.

Apple II 48K, 2 disks, Monitor III, Language Card, £800 ono. Silent-Tape printer, £60. Software available extra. Tel: 0442-69882 after 5pm.

Wanted CBM 64 or BBC B. Realistic price paid based on extras available and current retail. Singer, 122 Merriam Ave, Stanmore, Middx. 01-589 0071 (day).

Spectrum Software, originals at half-price plus postage. Including Jetpac, Zzoom, Flight Simulation, Hobbit, Manic Miner, VU-3D. Also ZX Printer, £22. Tel: Rugby 73594 eves.

Atari VCS for sale plus joystick paddle and 12 cartridges worth over £300. Sell for £215 only. Tel: 01-889 9887 after 6.30pm. Quick sale.

Newbrain A, guaranteed, beginners guide (including cassette). Income Tax (including cassette), Editor cassette, Re-number cassette. £200. 01-889 3571.

Seikosha GP 100A printer, new. May 1983, lightly used, £160 ono. Tel: Exmouth 0395-273709.

ZX81 + 16K RAM + home built console, books and various software cassettes (including Gulp 2, 3D-Defender, Flight Simulation, Black Crystal etc). £50 ono. the lot. Tel: Swindon 814637.

Spectrum 48K, Telesound 80, software, books. Sinclair ZX-printer, 15 spare rolls of paper, all for £140. Jupiter Ace Computer, £40. Tel: 01-854 5854.

Vic-Forth cartridge, unopened. Invite to Forth book, Byte magazine issue all about Forth. All perfect. Cost £55, offers. Tel: Ruislip 35173.

Lynx 48K as new. 2 books, Sultans Maze plus magazine software. £175 or £190 with Sony cassette recorder. Tel: 0294-812750 eves or weekends.

Wanted Printer for BBC Micro. Tel: Leeds 443565 (daytime), or Leeds 886441 eves and weekend).

Spectrum Software, swap or sell, C-scope metal detector, Astro Wars, £12 each or swap for peripherals (printer, joystick etc). Tel: 06065 (Windsford) 3882 (Martin) after 4pm.

Dragon 32 wanted. (preferably within 50 miles of Stoke on Trent). Tel: 0782-550 651. (N. White).

Sharp MZ80K Basic, Machine Code. Books for both and over £50 of games. £275 or near offer. Andrews, 11 Chantway, Sevenoaks, Kent. Tel: 0732-456804.

Atari 400 with Basic, 32K, 410 recorder. Star Raiders, Air Strike, Action Quest, Labyrinth Run. All manuals. £140 ono. Tel: Aldridge 53190 after 5pm.

BBC Software for sale. Lots of programs all under £1. Will exchange software too. Barry, 12 Leahoe Gardens, Hertford. Herts. Tel: Hertford 552754.

Apple II E 80 column card, new, unused, boxed part 820-0066 with manual. £40. Sittingbourne 73208 eves.

BBC Model B 1.2OS with tape recorder, leads, manual and Basic programming on the BBC micro. Some software. £350. Tel: 0480-213273 eves.

Video Genie EG3003, 48K plus manuals, books, software. 4 months old. As new. £225. Tel: Trevor (Portsmouth) 0705-667818 5-19pm, buyer collects.

HX-20, microcassette, tapes, printer paper, case. Approx 20 hrs use, charger and manuals included. £375 (could deliver). Botley 04892-5767 eves. (Stickland).

Atari 800, 48K with program recorder, joysticks, manuals and over £60 worth of software. £320 ono. Tel: Pontypool 4717.

Ikon Hobbit Drive for BBC with zero memory option, utilities tape and six data tapes. 2 months old, upgraded to disk. Shepherd, Sevenoaks 61621.

Intellivision plus ten games including Donkey Kong, Pitfall, Lock and Chase, Dungeons and Dragons. Excellent condition, only £150.

Wanted Commodore 2040 or 3040 dual disk drive or similar unit which would be compatible with my Pet. Tel: Tetbury (Glos) 0666-53796.

Commodore Vic 1540 disk drive + disks + leads + manual + Vicfile. £160 ono. Vic 1515 printer + manual + leads + paper, needs new ribbon. £130 ono. Tel: 01-301 3930 after 6.30pm.

BBC DISK interface, £70. LVL dual 200 K disk drives £320. Microvitec colour monitor £260, all new. Acornsoft cassettes £4, Micropower games £3.50. Davenry 3792.

Atari VCS plus five cartridges including Pacman. As good as new, cost £200, sell for £110 ono. Tel: Eversley 733717.

Apple II Europlus monitor MX80 printer disc drives, £900. Also Visicalc, Visi-plot, Easywriter, Vindex 80 col card, Tabs Accounting System, Utopia Graphics Tablet, Artist Designer. Offers? 0734 866372.

Microtan 65, Tanex with 8K RAM, PSU, Basic, X bug, full qwerty keyboard, Vero-rack, £100. Tel: Farnham (Surrey) 711188 after 7pm.

Sharp PC 1500 complete with CE150 printer and cassette interface plus CE155 8K RAM and manuals. Virtually new. Contact 01-450 9635 (evenings). Michael. £200.

CBS Colecovision inc. Donkey Kong, £110. Turbo Drive Module, £35. Zaxxon, £25. Sold together £155. All under guarantee. Tel: Bognor 821090.

Billboard Buy & Sell Form

To place your Billboard ad, fill in the form on the left, with one word per space, up to a maximum of 24 words. Send the completed form, together with a cheque or postal order for £1.50 made payable to VNU Business Publications, to: **Billboard, Personal Computer News, 62 Oxford Street, London W1A 2HG.** Note that we cannot guarantee that your ad appears in any specific issue, and that we cannot accept ads from commercial organisations of any sort.

Your name:

Address:

Telephone:

SIN-TAX ERRORS

Kemp review caper

We made some errors in our review of the Kemp Stock Control System in issue 35. One of these was that the REORDER list gave costs, it in fact gives quantities. We implied that there is only one search facility when there are two and the program is meant to be used as a full system.

Enterprising Elan

Our report from the Elan stand at the PCW Show (issue 31) hinted that it had a video recorder driving its graphics display. Well, it wasn't quite an Elan Enterprise 64 but it wasn't a video recorder either (see Random Access this week). Our apologies to Elan.

Computer T-shirt craze

Here's an idea you can put your shirt on from a West German company called Kema — computerised T-shirts.

Kema's advertising promises 'an instant money-earner that can earn you \$8,000 to \$10,000 per month'. All you need is a TV camera, a Kema Computer

Portrait System, and a steady supply of T-shirts. Sounds expensive? You bet. \$35,000 for the deluxe colour version.

But you'll soon be coining it as the eager populace beats a path to your door. And even if they don't, you'll have a lifetime supply of trendy T-shirts.

NEXT WEEK

Apricot

Take flight

Painting by numbers

Speech day

Games

Micropaedia

—PCN Pro-tests ACT's slimline micro.

—We survey flight simulations packages.

—A look at Paint, Atari's temptation to budding artists.

—Now you can talk to your Spectrum — but will it understand?

—Reviews of games for the Dragon, Commodore 64 and Vic 20, and Spectrum.

—PCN's pull-out programming guide moves into Part 8.

Mystical micro keyboard

Perceptive readers will have noticed something curious about Fuller's recent ads for the legendary FDS keyboard for the Sinclair Spectrum.

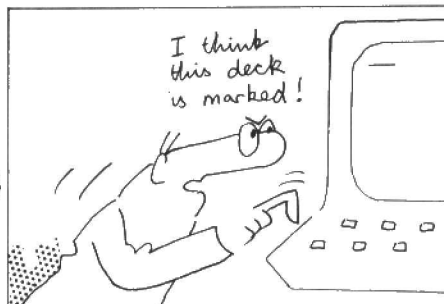
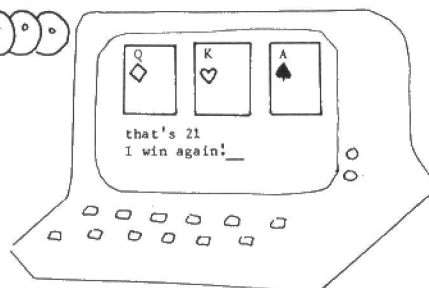
The alleged keyboard is shown in glorious technicolour, displaying to best advantage its amazing full-travel, typewriter-style keyboard.

Which is the curiosity. It's so typewriter-style it has ordinary typewriter keys — no tokenised single keystroke commands accessed by quadruple cross-draw shifts on alternate Tuesdays. We at PCN know a story when it falls on us, just so long as it falls hard enough.

Apparently Fuller has lots of cases, but is still waiting for the keys.

The FDS, with a nine-week waiting list two weeks ago (issue 34) is still a touch on the non-existent side, and — we can count too — now has an 11-week waiting list. Watch this space.

PAL2000
by Mollusc



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
Computertown UK	October 31- November 18	Nailsea Library, Avon	Byte Micro Computing Centre, 0272 851337
Home Computer Exhibition	November 9-13	Dublin	SDL Exhibitions, Dublin 763871
Personal Computers & Leisure Technology Exhibition — HOMETECH	November 11-13	Bristol Exhibition Centre	Homotech Exhibitions, 0272-650465
Malvern Micro Fair	November 12	Malvern Winter Gardens, Worcestershire	Personal Computer Fairs, Worcester 22659
Manchester Apple Village	November 13-16	Belle Vue, Manchester	Database Publications, 061-456 8383
COMPEC	November 15-18	London Olympia	Reed Exhibitions, 01-643 8040
Computer Aided Design for the Building Professional	November 16	RIBA, 66 Portland Place, London W1	Helen Carpenter, 01-637 8991
Humberside Computer Fair	November 20	Winter Gardens, Cleethorpes	Jenson Lee, 0472 42559
Northern Computer Fair	November 24-26	Belle Vue, Manchester	Reed Exhibitions, 01-643 8040
BBC Micro User Show	December 9-11	Westminster Exhibition Centre	Database Publications, 061-456-8383
Your Computer Christmas Fair	December 15-18	Wembley Conference Centre	Reed Exhibitions, 01-643 8040
Which Computer? Show	January 17-20	NEC, Birmingham	Clapp & Poliak Europe Ltd., 01-747 3131

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Gulf Computer Exhibition	November 21-24	Dubai	Trade Centre Management, 01-930 3881
Computer Indonesia	Nov 22-25	Jakarta	Overseas Exhibition Services Ltd., 01-486 1951
Computer Dealers Exhibition	November 28-Dec 2	Las Vegas, USA	Interface Group Conference & Exposition Management, 160 Speen St., Framingham, MA 01701, USA

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